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ARTS IIIIE/NY TRACON PROJECT IMPLEMENTATION PLAN



December 17, 1987

**DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION**

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FOREWORD

This order transmits the project implementation plan for the New York Terminal Radar Approach Control (NY TRACON) project. It provides guidance and direction for the orderly implementation of the ARTS IIIE at the NY TRACON. The procedures and responsibilities in this order were developed using current agency directives. This order establishes program management, project implementation policy and responsibilities governing the activities of organizations and also identifies and describes specific events and activities to be accomplished in order to implement the NY TRACON project.



Leland F. Page
Director, Automation Service

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NY TRACON SUSTAIN PROJECT IMPLEMENTATION PLAN

CHAPTER 1. GENERAL

1. PURPOSE. This order creates and establishes the Project Implementation Plan (PIP) for the New York Terminal Radar Approach Control (NY TRACON) Sustain Project. The Plan establishes program management, project implementation policy, and responsibilities governing the activities of organizations. The Plan also identifies and describes specific events and activities required to implement the NY TRACON program.

2. DISTRIBUTION. This order is distributed to the division level within the Automation Service, Program Engineering Service, Systems Engineering Service, Acquisition and Material, Systems Maintenance Service, Air Traffic Operations, and Air Traffic Plans and Requirements at FAA Headquarters, Washington, D.C.; to the division level at the FAA Technical Center; to the Airway Facilities and Air Traffic divisions within the Eastern Region; and to Airway Facilities and Air Traffic offices at the New York TRACON.

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CHAPTER 2. PROJECT OVERVIEW

20. SYNOPSIS.

a. The NY TRACON provides terminal air traffic control for the greater New York metropolitan area and interfaces with other Terminal and En Route air traffic control facilities that service the surrounding areas. The NY TRACON comprises communications, surveillance, automation and support equipment to assist air traffic controllers and other facility personnel. The existing automation system, the NY TRACON ARTS IIIA, was commissioned in January 1981.

b. The existing NY TRACON ARTS IIIA system provides the digitizing, processing and display of the surveillance information received from four radar/beacon sensors located at the Kennedy, Newark, Islip and Westchester County airports. The requirements for computer resource utilization have grown steadily over the last six years and software modifications have been implemented to meet these requirements. However, the system has now reached its maximum capacity; additional software modifications require an expansion of the hardware suite.

c. The NY TRACON upgrade (ARTS IIIE) will be a functionally distributed system. The originally proposed system utilizes a two-stage approach. Stage I involves replacing the current Data Entry and Display Subsystem (DEDS) equipment with Full Digital ARTS Displays (FDADs) and off-loading display processing from Input/Output Processors (IOPs) to more modern intelligent units with their own data handling capability. Stage II involves developing a final system configuration called ARTS IIIE, with new Solid State Memory (SSM), additional processors and software functionally reconfigured to provide a distributed system.

d. Due to time constraints and program evolution, the FAA has directed the contractor to develop an Interim Capacity Upgrade (ICU) project. The ICU project will utilize components of Stage 1 and Stage 2 to increase the track capacity at the NY TRACON. The increase in track capacity is to be accomplished by the early installation of FDADs, SSMs, and minor software modifications. The plan for the ICU project is to install FDADs and SSMs at the NY TRACON by the end of February 1988, and have the system available for operation by the end of April 1988.

21. PURPOSE.

a. The New York TRACON system must continue to provide the current level of reliability and the required air traffic control services until replacement by the Advanced Automation System (AAS). The NY TRACON was built to provide 1200 tracks, 40 local displays (including La Guardia BRITE Alphanumeric Subsystem), 6 remote displays, and 91 keyboards. The traffic growth in the New York area is projected to exceed the capacity of the existing NY TRACON ARTS IIIA system.

b. Over the time period 1980-2000, an 8 percent growth per year in air traffic operation is projected. The traffic demand on the ATC System is expected to continue to grow. The existing automation system cannot meet this need. The mission of the ARTS IIIE shall be to provide increased automation support to ATC in the airspace of the New York metropolitan area. This

airspace shall include coverage by; John F. Kennedy International, Newark, Islip, Westchester, and Mid Hudson Radars. The functionality of the ATC System must be expanded and improved to support the goals of more efficient flight and to take advantage of new airborne and navigation capabilities.

22. HISTORY.

a. The New York Common IFR room commenced operations in 1969 and combined the operations of Kennedy, La Guardia and Newark TRACONs. During the twelve years of its operation, it was the busiest TRACON in the world with the number of annual IFR operations varying between 850,000 and just over one million. During FY-82, the first year of operations at the NY TRACON, there were 1,028,470 IFR operations. In FY-84, the number increased to 1,440,974. This is roughly a 40% increase in operations in those two years. By summer of 1984, the level of traffic was such that the system capacity was strained.

b. The New York TRACON supports four sensors with an eight processor and sixteen memory module system. One of the processors and memories is used as a spare. The system was designed with a Central Track Store (CTS) of 1200 slots for track and flight plan data. By way of comparison the single sensor ARTS IIIA systems have two processors and eight memory modules with a CTS for 300 slots. Currently the system is sized for 1500 tracks; however, it is not capable of processing 1500 tracks due to lack of processing power. The distributed system has the greatest capability for meeting the needs of the New York TRACON. This is based on its flexibility, its easy transitioning into the operational environment and its ability to provide the quickest relief to the TRACON. Since it can initially utilize current hardware, it has a low risk related to hardware and software development.

c. The Request for Proposal (RFP) was released 6/24/85. Two contractors submitted proposals. After careful evaluation one contractor was selected for further negotiation. Contract DTFA01-86-C-00006 was awarded to Sperry Corporation on 14 March 1986.

23.-29. RESERVED.

CHAPTER 3. PROJECT DESCRIPTION

30. FUNCTIONAL DESCRIPTION. The NY TRACON will be enhanced to the ARTS IIIIE level in two stages, with an initial project ICU, to be accomplished in parallel with Stage 1 and Stage 2.

a. ICU. The ICU project (Figure 3-1) will provide early operational FDADs which will operate in the ARTS IIIIA mode. The SSMs will provide the capability for increased performance of the Data Processing Subsystem (DPS), thereby allowing the processing of up to 1565 tracks, and eliminating the alternate data block and single symbol data loss condition. This project will run in parallel with the current NY TRACON ARTS IIIIE Stage 1 and Stage 2 activities. The system will be characterized by the installation of twelve (12) FDADs at FAATC and thirty-seven (37) at the NY TRACON. FDAD and SSM hardware is detailed in the Stage 1 and Stage 2 "physical descriptions" to follow.

b. Stage 1. The Stage 1 system (Figure 3-2) will utilize the FDADs installed during the ICU project. These displays will be plug-compatible with the existing displays to allow quick transition with no effect on operations. The FDADs contain microprocessors which perform the display processing function. This function will be removed from the central processors, IOPs, to provide the central processors with greater system capacity. Stage 1 will also incorporate a network to provide the subsystem interface between the processors and the smart displays.

(1) Stage 1 hardware additions include; the FDADs, the Local BANS Processor (LBP), the Remote BANS Processor (RBP), the network, the IOPB Network Interface Adapter (NIA) and the transition switches. The FDAD is plug compatible with the ARTS IIIIA DEDS and also has the network interface required for ARTS IIIIE. The FDP contains a 1.76 MIP microprocessor to do the display processing off-loaded from the IOPBs. This same microprocessor is used in the LBP and the RBP to furnish the ARTS IIIIE display processing for the tower display. The network is an IEEE 802.3 dual (maintenance and operational) trunk configuration. The present NY IOPB complex is retained intact, with the exception of the Multiplexed Display Buffer Memory (MDBM). The Local Area Network (LAN) interface utilizes available spare channels for I/O channels. Cutover/fall back is essentially accomplished by using the FDAD ARTS IIIIA/IIIIE switch and rebooting the proper operational program in the system.

(2) The Stage 1 software requires a logical decoupling of the display processing software from the current program, and the addition of an I/O driver for the Local Area Network (LAN). The Stage 1 data formats have purposely been kept as similar as possible in order to minimize change in the software and thus reduce risk. Only the Keyboard Functional Processing module requires extensive modification for the FDAD, four modules - DP Keyboard Processing, Data Entry Control, Refresh Formatting and Refresh Memory Management - require modification. All modules, other than those included in the IOPBs, will be designed using a Program Design Language (PDL), and developed in the "C" language. A significant portion of the software contained in the FDP, LBP and RBP will have common logic, e.g., the network interface modules and the kernel executive.

c. Stage 2. In the Stage 2 system (Figure 3-3) the tracking function will be off-loaded to a track processing subsystem. The off-load of the tracking function and the addition of semiconductor memory during Stage 2 will provide the needed capacity to support the air traffic requirements through the year 2000 and allow capacity for the performance of additional functions such as enhanced conflict alert, enhanced MSAW, metering and spacing and Mode S. The Stage 2 System Design is characterized by the addition of a Tracking Processor (TP) made up of a new IOPB complex, a new System Monitor Console (SMC), a new Continuous Data Recording (CDR) disk system, and an external real time clock.

(1) The system processing is functionally partitioned into the logical division of Tracking (TP), Display (DP) and Common (CP). The Stage 2 system is integrated by use of the network flexibility.

(2) The system partitioning and LAN configuration provide an inherent "backup" capability and a safe modular transition for the Remote Full Digital Display (RFDD) option. The distributed system and network configuration provide a flexible base for any modular addition, e.g. Mode S. Although significant, the Stage 2 implementation is, in essence, one modular addition to the distributed architecture deployed in Stage 1.

(3) The CP complex is the current NY TRACON ARTS IIIA IOPB based system. The SRAP inputs are switched from the CP to the TP in Stage 2. The TP consists of 6 IOPBs. The TP interface to the network is through a similar Network Interface Adapter (NIA) used in Stage 1 for the CP. Both the TP and CP are outfitted with the new solid state memory. This new memory provides performance, reliability, and physical space advantages over the current core based memories.

(4) The TP peripherals are identical to the CP peripherals except that a new off-the-shelf disk system is added for program loading and recovery called the Program Load Device (PLD). The disk is configured on a standard 30 bit IOP channel with quadriplexed I/O ports as per the present NY disk system. The new PLD is compatible with the DPS and both the current recovery programs in bootstrap Non-Destructive Readout Memory (NDRO) and in the loadable recovery modules. The PLD microprocessor code simply emulates the current ARTS disk. The IOP will recover as if the load device was the current ARTS disk subsystem. The PLD also contains an ARTS compatible tape drive and a floppy disk capability for program modifications/updates.

(5) Stage 2 software experiences an evolutionary change which separates the track-related functions from the remaining system processing. This division of the DPS, into the TP and the CP subsystems, will permit system expansion to accommodate future requirements (if necessary).

(6) The distribution of the functions results in the following major subsystems: The CP, TP, DP, Network, and the System Monitor Console (SMC) which includes Continuous Data Recording (CDR). The functional flow is essentially unchanged from the current NY TRACON system and from Stage 1. The basic functions are the same but they are separated and interfaced via the network.

Figure 3-1. NY TRACON ICU Configuration

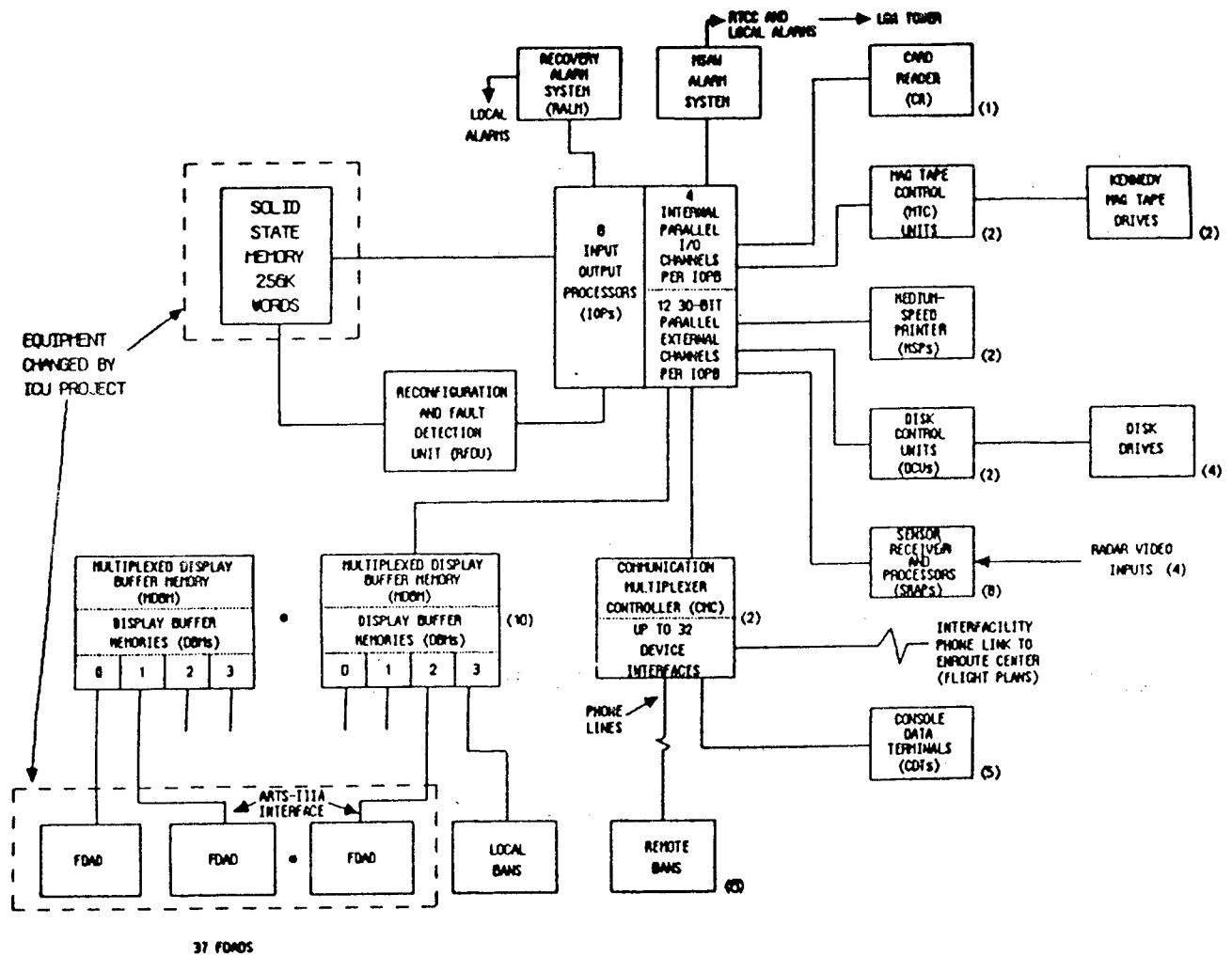


Figure 3-2. NY TRACON Stage 1 Configuration

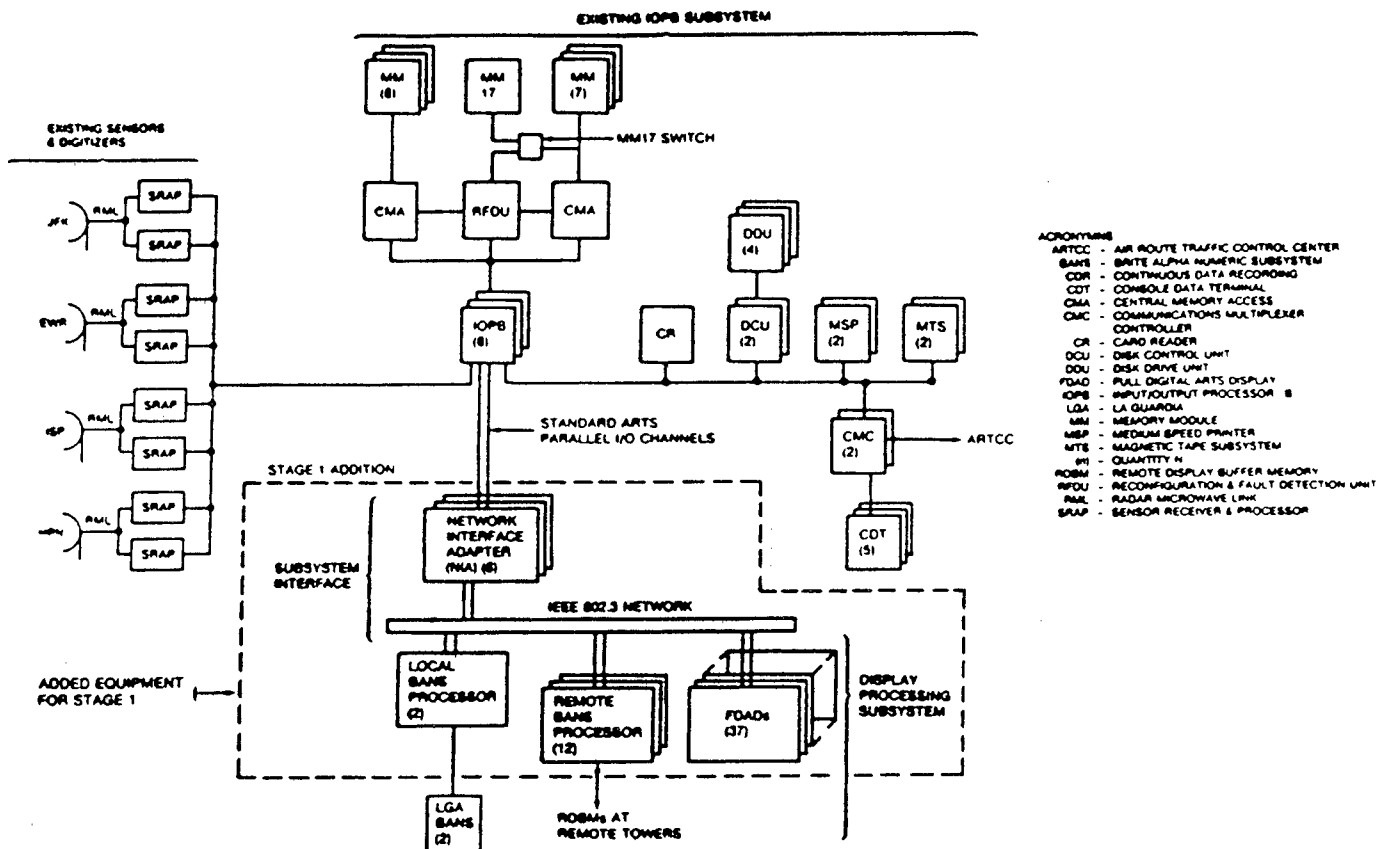
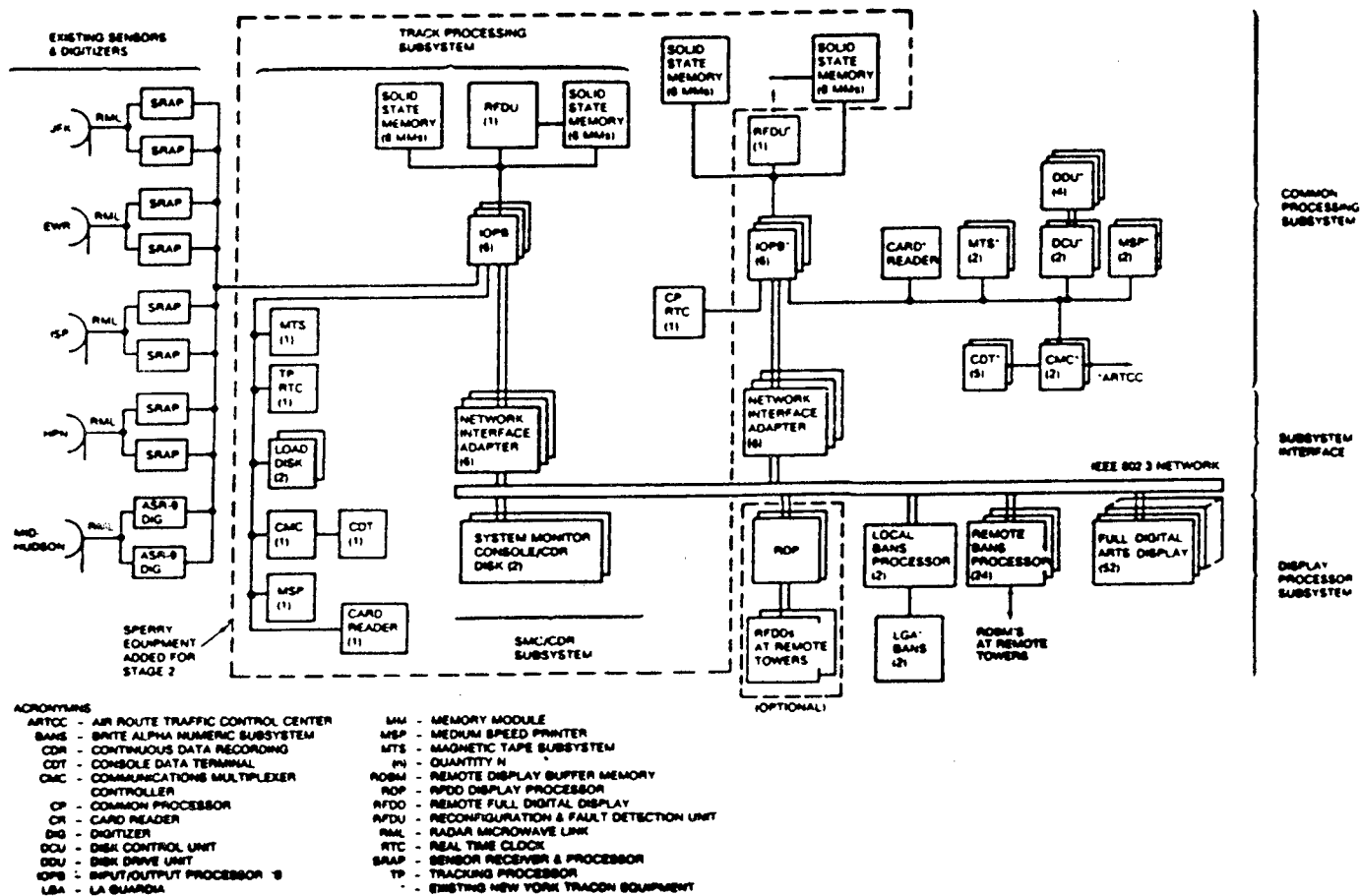


Figure 3-3. NY TRACON Stage 2 Configuration



d. Modes of Operation. The five modes of operation of the ARTS IIIE are as follows:

(1) Normal Mode - The normal mode is all operational functions and off-line support functions simultaneously performed without conflict.

(2) Fail Safe Mode - The fail safe mode is all operational functions being performed with redundant hardware.

(3) Fail Soft Mode - The fail soft mode is operation with some loss of functional capability.

(4) Backup Mode - The backup mode is operation with the loss of Common Processor (CP) functions.

(5) Broadband Mode - The broadband mode is loss of all automation functions.

31. PHYSICAL DESCRIPTION. The following paragraphs describe each major item identified in Figures 3-1, 3-2, and 3-3. Additionally, major items necessary to support the implementation and maintenance of the ARTS IIIE (i.e., transition switches, racks, Software Development Station, EPROM burner, etc.) are described.

a. Basic Full Digital ARTS Display (BFDAD).

(1) The BFDAD provides the man/machine-interface between the air traffic control search radar/beacon and processors, and the air traffic controller. The BFDAD provides for a combined display of radar Plan Position Indicator (PPI) and the computer generated synthetic display of the air traffic situation in the operator's control area, with operator controlled display selection and data entry capabilities.

(2) The BFDAD is a microprocessor-driven air traffic control display console that forms an integral part of the ARTS IIIE system. It presents the traffic situation display to the air traffic controller and accomplishes an allocated portion of the system data processing load.

b. FDP.

(1) ARTS IIIE digital data is received by the FDP over the subsystem network. Using this data link, the FDP creates its own internal database of track information and sends this data to the BFDAD from which the display screen is created. The FDP is configured into the BFDAD as an embedded card cage with power, cooling network switching, overtemp sensors, cabling and connectors supplied by the BFDAD. The card cage contains 10 percent spare card locations beyond those required for the Stage 2 final system configuration. When the FDP is integrated into the BFDAD, an FDAD is created.

(2) The card cage uses an industry standard VME backplane to provide for communication between printed circuit cards located in the card cage. The VME bus backplane is the IEEE P1014/D1.1 bus standard.

c. LBP.

(1) The LBP provides the interface between the subsystem network and the local BANS hardware. The interface is 100% compatible with the existing BANS. The LBP provides the display output processing, keyboard processing and quick look processing. Refresh data to the BANS is provided via a programmable processor in the LBP. A transition switch will allow either the current MDBM/IOPB system (ARTS IIIA) to communicate with the local BANS or the LBP (ARTS IIIE) to communicate with the local BANS at cutover time.

(2) LBP architecture is based on the field proven VME backplane bus. The 32-bit data bus provides for efficient data transfers between the MC68020 processor and other PC cards. The 32-bit address bus exceeds ARTS IIIE system design limit requirements and provides for future growth. The maximum transfer rate on the printed circuit backplane is 20 MHz.

(3) A total of five VME printed circuit card modules are contained in the LBP chassis. A serial, full duplex interface to the operation network is provided via two LAN controller card modules, one connected to the active channel and the other connected to the standby channel. A network switch provides for simultaneous switching of both LAN Controllers between the Operational and the Maintenance network. The LAN controller card module is an intelligent module that performs network protocol handling functions. The LAN controller card module is based on a MC68010 microprocessor which controls VLSI IEEE 802.3 network control circuits, 128K bytes of RAM and VME bus interface logic.

(4) Interface to the BANS is via a full duplex Parallel Interface Module (PIM) which connects to a 30-bit type A input and output channel. A DMA controller integrated circuit provides for direct access to VME-addressed memory, and a first-in-first-out memory provides the buffer to match BANS channel speed to VME bus speed.

(5) The main processor printed circuit card module provides display processing, configuration control, and diagnostic functions. VME bus arbitration logic, interrupt handling logic, and 1 megabyte of RAM are also contained on the main processor module card. The processing element is an MC68020 microprocessor which is a high performance, field proven, 32-bit microprocessor. Status and control registers provide on-board and chassis wide status information to the on-board microprocessor. By reading the status and control bits, the MC68020 microprocessor can determine VME bus information, interrupt status, the source of a particular bus error, and which self-test to perform. On-board EPROM (64K bytes) provides storage for the processor card power-on diagnostics, a bootstrap program to transfer application software from the EEPROM memory module to the on-board RAM card for execution and a program to interface with an off-line maintenance and diagnostic CRT terminal. The EPROM also contains a bootstrap program to enable loading the EEPROM from the subsystem interface (network). The RAM memory has two 32-bit ports, one for VME bus global access and the other for local processor access. On-board byte parity generation and checking circuitry provides error detection capability. A status/control register controls error reporting techniques and memory configuration. Exception processing is performed when detection of address errors, bus errors, format errors, illegal or unimplemented instructions, and attempted execution of privileged instructions occurs.

(6) The EEPROM printed circuit card module is used for application program storage and diagnostic program storage. The storage devices will be electrically erasable, programmable read only memory (EEPROM) integrated circuits. Changes to the software can be accomplished by down-loading the new software via the network to the EEPROM in the chassis.

d. (RBP).

(1) The RBP provides the interface between the subsystem network and the modems that interface to the RDBMs. The RBP provides a 100% compatible interface to the RDBMs. Two RBPs interface to each RDBM via modems/telephone lines. The RBP provides the display output processing keyboard processing and quick look processing. The RBP has its own programmable processor. Transition switches will allow either the current CMC/IOPB ARTS IIIA system to communicate with the RDBMs or the RBP (ARTS IIIE) to communicate with the RDBMs.

(2) RBP architecture is common with other VME-based equipments, including the LBP. A total of five VME printed circuit card modules are contained in the RBP; four modules are common with the LBP. Interface to the operational network is via two LAN controller card modules as described in the LBP.

(3) A serial input/output (SIO) module provides a full-duplex interface between the RBP and RDBM modem. The SIO card module is based on a MC68010 microprocessor that controls two serial communications controller chips, a DMA controller chip, 128K bytes of RAM, and VME bus interface logic. Data rates up to 300K bits per second are possible. The current GFE ARTS IIIA modems will determine the actual rate, and these will be used in the ARTS IIIE.

(4) A main processor printed circuit card module provides display processing configuration control and diagnostic functions as described in the LBP. An EEPROM printed circuit card module is used for application program storage and diagnostic program storage.

e. NIA.

(1) An intelligent NIA connects each IOPB to the Operational and Maintenance networks, handles protocols, and relieves the IOPB of network processing overhead. NIA architecture is based on the field proven VME backplane bus.

(2) Functionality is provided by a total of six VME printed circuit card modules contained in the NIA chassis. Interface to the operational network is via two LAN Controller card modules. One is connected to the active channel and the other is connected to the standby channel. The network switch provides for switching between the maintenance network and the operational network. Interface to the IOPB is via two Parallel Interface Module (PIM) cards, and each card connects to a 30 bit input and output channel. A processor printed circuit card provides NIA coordination, configuration control and diagnostic functions. The processor card contains an-board RAM (1 megabyte) for program and data storage during execution. An EEPROM card module has 256K bytes and is used for application program storage

and diagnostic program storage. The storage devices will be electrically erasable programmable read only memory (EEPROM) integrated circuits.

(3) The medium for each of the four network channels (operational active/standby and maintenance active/standby) is a transmission line consisting of a special shielded 50-ohm coaxial cable terminated at both ends. Four coaxial cables form the interconnect backbone for Sperry's subsystem interface design. In effect, this compact backbone replaces most of the point-to-point parallel input/output channel cables used to connect the hardware elements of the existing system, significantly reducing cabling bulk and complexity. The initial network cable segment has a capacity for 100 stations (at NY TRACON). Additional segments up to the maximum of 5 may be added with the use of cable repeaters, permitting a maximum of 500 stations. Each node can recognize 1 of up to 256 network addresses.

(4) Nodes attach to the network coaxial cable with a nonintrusive tapping transceiver. This transceiver connects to the cable by a tap mechanism probe that pierces through the cable and contacts the cable's center conductor and braid shield. These probes maintain a reliable gas-tight contact in extreme environments while compensating for variations in cable construction. Since the cable need not be cut, use of this connection method allows the transceiver tap to be installed or removed on an operating network without disturbing network traffic. For ease of service, the transceiver unit can be detached from the network without removing the tap.

(a) Transceiver Cables. The purpose of these cables is to provide final cable interconnection between the transceiver and the LAN Controllers contained in the FDPs, LBPs, RBPs, and NIAs. They interconnect between transceivers and Network Transfer Switches and between Network Transfer Switches and LAN Controllers. Their maximum length is 50 meters.

f. Maintenance Console. The purpose of the maintenance terminal is to serve as a diagnostic and monitoring tool for the VME equipment. The Visual 65 display terminal is used as a monitoring and diagnostic tool to analyze the functions of the FDP, RBP, LBP, or NIA equipment by plugging its cable into the RS-232 connector to the main processor card module. The operator selects the function to be performed from the menu that is displayed. Among the features of the Visual 65 display terminal are programmable nonvolatile function keys, selectable scrolling region, menu style set up mode, 7 x 9 dot matrix characters, 24 lines by 80 columns (25th line is the status line). The maintenance console also has the capability to be interfaced to a standard (Centronics interface) printer for hardcopy listings. The external interface to the FDP, RBP, LBP, or NIA equipment is RS-232. The display terminal is capable of operating in either half or full duplex. The FDP, RBP, LBP, and NIA utilize the duplex mode. The terminal is a Z-80, 8-bit, microprocessor based. Data communications supports 128 character ASCII code, and the electrical signals are serial asynchronous. The data rate is selectable from 75 bps to 19.25k bps.

g. Software Development Terminal, Printer, and EPROM Burner.

(1) The microprocessor Software Development System (SDS) consists of up to ten software development stations, each of which has a personal computer capable of being interfaced to the SAAS 1100 system. In Stage 1, two PCs will

be delivered per site. The remainder will be delivered in Stage 2. The purpose of the SDS is to both maintain the source language of the delivered software and to generate object code executable on the target processor(s). This software includes programs written in both the "C" language and the current ARTS IIIA IOPB assembler language. The ARTS IIIA IOPB assembly language is ULTRA.

(2) Each of the eight PCs is an off-the-shelf Sperry Model 400 PC with a monitor, printer and a keyboard for operator control. It contains 640K bytes of memory in an 8088 microprocessor and a time of day clock. It also includes one 5 1/4 inch floppy diskette (360K bytes) and one fixed disk with a 20 megabyte drive. Operator input is via an 84-key keyboard that is full ASCII with 10 function keys. The printer is a Model 5 printer which is a bidirectional, 9x9 dotmatrix printer. Printer speed is 100 characters per second. The monitor is a 22cm by 16.5cm monochrome display with a 25 line by 80 column format. The SDS PCs have one additional feature, namely an additional accelerator board which is a DS32 processor card. This adds a 32 bit 10 megahertz processor and 2 megabytes of RAM. This additional feature enables rapid compiling of "C" language programs.

(3) The source language of the software to be processed at the SDS will be maintained in the 1100 system which is the current standalone assembly system (SAAS) at the FAATC. The interface between the SDS PCs and the SAAS can be either via GFE modems (up to 9600 baud) or via a GFE 1100 terminal multiplexer. Programs written for the IOPB will still be assembled in the 1100 as is currently planned.

(4) Programs written in "C" language (for the MC68010 and MC68020 processor in the FDP, LBP, RBP, and NIA) will also have their source language maintained in the 1100 (SAAS), but the actual compiles will occur in the PC. The output of the compiler (object code) can be sent either directly to the target chassis (e.g., an FDP) or to an EPROM burner. Program listings can be put into a file for faster printing than could be done on the PC printer (Model 5). The EPROM burner (FAATC only) will be purchased from Sector/Varix.

h. ATC Racks.

(1) Standard 19-inch rack cabinets will be used to house various equipments required in the FAATC and NY TRACON system. This equipment will include Communications Multiplexer Controllers (CMCs), Card Readers and Controllers (CRs and CRCs), Magnetic Tape Systems (MTS), and Real Time Clocks (RTCs). These racks carry the designation FA-8380.

(a) The basic rack cabinet will contain:

1. Control panel assembly.
2. Blower and filter assembly.
3. Plug-in power strip.
4. Chassis ground bus.

5. Signal ground bus.
6. Duplex ac outlets.
7. 63" of space for equipment installation.

(2) The modified 19-Inch ATC rack is used to house LBPs, RBPs, NIAs, and assorted transition switches. They consist of a standard 19-inch ATC rack (FA-8380) modified to remove the blower assembly (since each VME chassis provides its own cooling). An air plenum is added in the cabinet to direct airflow to each chassis, a louvered rear door provides for air exhaust and cable retractors provide for extension/removal of each chassis. System cables attached to connector plates at the top of each cabinet and internal cables provide the interconnect between the cabinet connector plates and each chassis.

i. RS232C and 30-Bit Transition Switches.

(1) The transition switches are to be used during system integration and testing at FAATC and NY TRACON. Transition switches allow rapid transfer of connection between the new equipment under test and the old system. After system integration and testing is completed, the transition switches can be retained in the system for further testing.

(2) Transition switches are used in two areas: switching of RS-232 cables and switching of 30-bit data cables. The AB transfer switch modules are manufactured by the Connecticut Technical Corporation. A standalone model 1320 is used for the RS-232 switch and rack mount model 1321 for 30-bit switching. The 1320 and the 1321 models transfer 24 leads with the push of a button. Features of this switch include printed circuit board construction, gold plated self-cleaning contacts, and push buttons that incorporate high visibility color coded flags and legends to indicate switch status.

(3) RS-232 switching is accomplished with a single AB transfer switch module. Switching of a 30-bit data cable requires the use of three AB transfer switch modules for each cable or a total of six for an input and output cable. The six push button switch modules are mounted in a 19-inch chassis in an open-type rack. Neither the standalone module nor the rack mounted module require power and both are data, baud rate, and protocol independent. The switch modules are easily replaceable for on-line maintenance.

j. Processor Cabinet.

(1) The Processor Cabinet provides enclosure, power distribution, control and warning indicators, and cooling for IOPBs, RFDUs, and memories. Hinge mounted access panels on both front and rear permit access to internal logic devices. A Power Control Panel provides power switches, fuses, power outlets, and indicators.

(2) The cabinet holds up to four system modules, two in front and two in back. A control cooling plenum provides efficient cooling (with built-in blower fans) and physical support for the modules.

k. Input/Output Processor B (IOPB). The IOPBs are identical to the current IOPBs used in the NY TRACON ARTS IIIA system. They are described by the IOPB Manual, PX-12096 (The IOPB FAA Type Number is FA-8303B). The IOPB includes the Break Point Module, Channel Back-To-Back Switches (FA-8365), and Recovery Alarm (FA-8314). The processors and options are housed in the standard Processor Cabinet (FA-8301). Additional data can be found in ATC-21000, ATC Hardware Design Data.

l. Breakpoint Module (BPM). The BPM is an 18-bit switch selectable device that is capable of stopping the IOP at a selected condition and address. The BPM is a valuable maintenance and debug aid which can facilitate the checkout of new software or aid in tracking down a difficult hardware problem.

m. Channel Back-To-Back Switch (CBBS). The CBBS is used during the diagnostic program. The CBBS permits interfacing of output channels to input channels without physically removing the I/O cables. Each CBBS cabinet unit will be externally attached to the front top of the Input/Output Processor (IOP) or stacked on another CBBS unit. The CBBS allows the diagnostic programs to exercise the control and I/O sections of the processor without interference from the external peripheral. When the CBBS is activated by setting a channel switch to the back to back mode (switch in up position), the external peripheral device is disconnected, and the output data and control signals are connected to the input of the channel being tested.

n. Recovery Alarm (RALM). The recovery alarm is the audible output which results upon the occurrence of a scatter interrupt. The RALM is hardwired directly to the processor. The RALM activation by a single processor is daisy chained to the processor equipped with an interconnect assembly. The interconnect assembly is connected to a single aural alarm control unit. The aural alarm control unit is capable of powering up to six speakers.

o. SSM and Memory Switch.

(1) SSM will be implemented during the ICU project; however, the Stage 2 TP will be equipped with SSM as well. Two of these solid state memory chassis will provide the full memory complement of 256K words. These two chassis will each occupy 1/2 of a processor cabinet. The equivalent ARTS IIIA memory occupies 4 1/2 processor cabinets. Each solid state memory chassis contains eight 16K memory modules with interface hardware for up to eight IOPBs and one Reconfiguration and Fault Detection Unit (RFDU).

(2) The RFDU interface is incorporated into the bank 4-7 portion (half) of the memory chassis. This interface is provided by a single printed circuit assembly, and is required in only one of the memory chassis in the system. The current memory module 17 interface switch module (ISM) is eliminated with this approach.

(3) The SSM has several advantages over the ARTS IIIA core memory subsystems. These advantages are:

(a) Increased processor efficiency.

- (b) Built-in multiplexer for up to 8 requestors.
- (c) Faster read and write memory access times.
- (d) Reduced power consumption.
- (e) Less physical space required.
- (f) Increased reliability.
- (g) Increased maintainability.
- (h) Ease of future array expansion.
- (i) Elimination of queuing problems.

(4) The SSM consists of four distinct circuit card types. A memory timing and control circuit card, a memory array circuit card assembly with a second memory array circuit card for expansion, a memory requester circuit card, and an RFDU interface circuit card.

(5) Transition memory switches will be provided for switching between the SSM and the current core memory.

p. RFDU. The RFDU allows for the automatic partitioning of the IOPBs and 16K memory modules by means of a 9 by 16 reconfiguration matrix. This is used to remove failed modules and enable backup modules under program control without operator intervention. The RFDU is identical to the current one used in the ARTS IIIA at the NY TRACON. It is FAA type number FA-8309. Reference PX-12098, ARTS IIIA Reconfiguration and Fault Detection Unit Manual. Additional data can be found in ATC-21000, ATC Hardware Design Data.

q. Communications Multiplexer Controller (CMC). The CMC will multiplex any combination of up to 32 plug-in simplex transmit or receive peripheral interface adapters with either of two ARTS III Input/Output Processors (IOPs). The CMC will consist of a multiplexer, standardized plug-in facilities to accommodate a variety of interface adapters, and a self-contained power supply. These elements of the CMC will be contained on a common chassis designed for installation as a slide-mounted drawer in the standard 19-inch rack cabinet. Cooling for the CMC will be provided by a fan mounted inside the chassis. Power to operate the CMC will be obtainable from any standard 120-volt ac, 60 hertz source. This equipment is identical to the CMC equipment currently installed at the NY TRACON.

r. Card Reader and Controller. The card reader utilizes a Peripheral Dynamics model 3055H rack mounted card reader and a DATUM card reader controller. The card reader subsystem configuration interfaces with two Univac IOP computers through the card reader controller. The card reader is capable of reading 80-column cards at a maximum rate of 300 cards per minute. Data is read photoelectrically one column at a time and converted to logic levels. Data and status of the card reader are presented on output signal lines to the card reader controller unit. This equipment is identical to that currently installed in the NY TRACON.

s. Real Time Clock (RTC).

(1) The equipment required is subdivided into four functional elements. The first element is the WWV receiver. This device receives the WWV time standard broadcast and provides an output that may be used for

calibration of the time code generator. The second element is the time code generator. This unit generates the time code and provides the interface to the IOP. The third element is the battery power supply. This unit acts as an uninterruptible power source to maintain the time code generator operation during periods of AC power failure. The fourth element is the Receiving Antenna Assembly. The WWV broadcast is received by a special high frequency receiver. This receiver has the performance characteristics necessary to provide accurate time calibrations. The receiver output is the detected WWV audio signal that contains the time tick used for synchronization. This output is connected to the Time Code Generator (TCG).

(2) The Time Code Generator provides time code data to the Input/Output Processor (IOP). The time data is transferred to the IOP via a standard parallel channel. The time data can be slowed to provide synchronization with the WWV time tick. In addition, a 1024 Hz rate output will be provided.

(3) The battery power supply provides DC power to the Time Code Generator during periods of AC power failure. The TCG must continue to maintain accurate time code data for a minimum of four continuous hours of AC power loss. During periods of normal AC power input, the battery will be maintained in a fully charged condition.

(4) WWV Receiving Antennas - Received RF signal power decreases as the distance between the receiver and transmitter is increased. The radio waves arrive at different angles depending on the distance to the transmitting station and the height of the ionosphere. The selection and orientation of a receiving antenna must take into consideration these factors of wave angle and distances as well as direction of the transmitter and which frequencies are best received at the receiver site. For additional information concerning the selection of WWV/WWVH receiving antennas, refer to National Bureau of Standards Technical Note Number 668.

t. System Monitor Console (SMC) and Printer.

(1) The SMC subsystem provides a significant departure from like functions implemented in the current New York TRACON system. It is a subsystem on the system network, able to communicate with each of the other subsystems. This enables the SMC to instantaneously gather information including alarms, alerts, status data, and performance data from each of the other subsystems and provide a common location in the system for display and printing of these messages as well as for system control.

(2) The SMC is an off-the-shelf Motorola VME/10 microcomputer system. It features a 68010 microprocessor and 385 kbytes of memory, with reserve power in excess of requirements while providing language commonality with the other microprocessors. Operator input is made with the detachable full ASCII keyboard which includes 16 function keys allowing menu input control. A 5 1/2 inch floppy disk is used for initial program loading from the development system. The SMC operational program resides on an internal 15 mbyte Winchester disk for program storage and loading. Operator display presentation is provided on a 15 inch monochrome CRT with a 25-line by 80-column format. A 600 line per minute, 132 column printer is included with

each SMC subsystem for hardcopy recording. Normal communication with the operational system is via the operational network. Off-line communication for the RETRAK program is via the maintenance network ensuring non-interference with the operational network.

(3) SMC operational functions include display and hardcopy recording of status, alarms, alerts, performance data and all actions affecting the system. The SMC will also provide menu-driven system control for Start/Restart, Subsystem Element Enable/Disable, Peripheral Enable/Disable and System Time-out monitoring.

u. Console Data Terminal (CDT).

(1) The CDT is a teletype model 40/1 data terminal consisting of the following units.

- (a) Keyboard Display (with pedestal).
- (b) Printer Mechanism.
- (c) Printer Cabinet.
- (d) Form Accumulator.
- (e) Pedestal.
- (f) Pedestal Top.

(2) The CDT will interface with the Communications Multiplexer Controller (CMC) via an asynchronous serial EIA RS-232-C channel. The serial EIA RS-232-C interface is limited to a maximum distance of 50 feet between units; therefore, modems will be used to interface the CDT and CMC where the distance between the units will be greater than 50 ft.

(3) The CDT display will have a 127 character repertoire with a 24 line x 80 character per line format. Each character will be refreshed at a 60 Hz rate. Each character will be laid out on a 7 x 9 matrix. The display will have a character size cursor which does not hide the characters. Display editing controls will include character and line delete and insert controls as well as cursor up, down, left, right, return, and home controls. Whenever a parity error is detected in receive data, the symbol S_B will be inserted in place of the character with the error.

(4) The display has the following additional controls:

(a) Display On-Off - Turns display module and keyboard on-off. Off permits terminal to receive and print only, if print on-line switch is depressed.

(b) Tube Tilt - Tilts display screen forward and backward to compensate for nearby lighting glare.

(c) Brightness - Increases and decreases intensity of displayed characters.

(5) The printer used in the CDT is the same printer used in the MSP. The printer is capable of printing 132 characters per line but the controller in the CDT will only accept 80 characters per line due to the limit of the display. Therefore, the printer will only print 80 characters per line. The Miltope control discussed in the MSP is not used in the CDT. The controller is contained in the logic module of the CDT.

v. Medium Speed Printer (MSP).

(1) The MSP consists of a Teletype Model 40-OEM printer (Printer Mechanism - 40201/AL, Printer Cabinet - 40CAB353AA, Form Accumulator - 405544, Pedestal - 40CAB904AA and Pedestal Top - 401913), modified by the addition of a controller to provide interfacing to two Univac IOPs. The Controller is supplied by the Miltope and mounts under the printer pedestal.

(2) The controller will be capable of accepting data and commands from a UNIVAC IOP and correctly sending the data to the Medium Speed Printer (MSP). The controller will have a dual-channel capability to permit interface with two IOPs. Separate driver circuits will be provided for each IOP. The channels will meet the external I/O, Type A, channel requirements specified in Univac Specification, SB-10205, Rev. B. The printer is a tractor feed 132 column wide machine capable of printing at speeds of 300 lines/min when printing a full 132 characters per line. The character set used is a 64 character monospace ASCII subset. There are two 132 character buffers in the printer so that as it prints from one buffer, the other buffer can be loading.

w. Program Load Device and CRT Terminal.

(1) The Program Load Device is an off-the-shelf item provided for program loading and recovery in the TP subsystem. This disk system is based upon the 19 inch mounted microprocessor chassis used for the NIA, RBP, and LBP. The disk is configured on a standard 30 bit IOP channel with quadruplexed I/O ports as per the present NY disk system. The new PLD is compatible with the DPS and both the current recovery programs in bootstart NDRO (Non-Destructive Readout Memory) and in the loadable recovery modules. The PLD microprocessor code simply emulates the current ARTS disk. The IOP will recover as if the load device was the current ARTS disk subsystem. The PLD also contains a Winchester disk drive and a floppy disk capability for program modifications/updates.

(2) The Winchester disk drive provides fixed disk storage of programs for the TP subsystem. The disk drive provides up to 25.6M bytes (unformatted) of storage and a data rate of 5M bits per seconds. The floppy disk drives provide up to 500K bytes of removable storage. The data transfer rate is 250K bits per second.

(3) The CRT terminal is a portable device and will interface with the Program Load Device Chassis via a standard RS232C channel. The CRT terminal is the on-line operator interface device used to control program loading onto the Winchester drive.

x. Continuous Data Recording Processor, Disk Drive, and Tape Transport.

(1) Continuous data recording will take place within a system node (subsystem) dedicated to this function. It will consist of three 344 megabyte Winchester disk drives and two high-density (6250 FPI) tapes all controlled by redundant CDR processors. Features include:

- (a) High density tapes offer space conservation in archiving.
- (b) CDR function divorced from program load device.
- (c) Failsafe operation through redundancy.
- (d) Simultaneous recording and reading (for editing or retrack processing) of CDR data.

(2) When a disk drive reaches capacity during operation, recording will switch to another drive, and the SMC operator will be informed to mount and enable tapes for copying from disk. Each tape holds approximately twice the data currently held on one ARTS IIIA disk pack.

(3) The Fixed Storage Drive (FSD) is a 9-inch rigid disk drive that provides 344 megabytes of storage in a sealed module. The FSD uses the industry standard SMD interface which provides a data transfer rate up to 9.67M bits per second. On-board diagnostics simplify troubleshooting and fault isolation.

(4) The 1/2 inch Tape Transport utilizes streaming techniques to provide dependable disk backup. The CDC Model 92185 writes and reads the industry standard 6250 bits per inch Group Coded Recording (GCR) format. A high speed Pertec interface has a 128K byte data buffer. Diagnostic tests provide for fault isolation.

y. SRAP Transition Switch (STS) and Rack.

(1) Standard ARTS IIIA 30 bit parallel transition switches are used to switch the SRAP inputs from the Stage 1 DPS (the original NY TRACON DPS) to the TP IOPs (the original DPS becomes the CP). Stage 2 implementation will require 2 switches per SRAP. The ASR-9 does not require a switch since fall back to Stage 1 operation means fall back to Stage 1 software which does not include ASR-9.

(2) The stand-alone STS Rack will provide mounting for the SRAP transition switches. The switches and rack will remain onsite until the FAA determines that a fall-back capability is no longer required.

z. Magnetic Transport and Controller.

(1) The Magnetic Tape Subsystem (MTS) will consist of a controller and one magnetic tape transport. The MTS will provide the capability of reading and writing IBM compatible digital tapes. The controller can provide interfaces to four tape transports from either of two IOPs.

(2) The Magnetic Tape Transport (MTT) will be a Kennedy Model 7890014 Digital Tape Transport. The Kennedy Model 7890014 is a digital

magnetic tape unit that with proper external formatting control is capable of reading and writing IBM compatible tapes.

(3) The Magnetic Tape Controller (MTC) will act as the interface between IOP and a Kennedy Model 7890014 Magnetic Tape Transport. The MTC will accept output data and commands from the IOP and will present input data and interrupts to the IOP. In turn the MTC will present read data and MTC status to the IOP and will accept write data and commands from the MTC. By use of the MTC, it will be possible to read and write IBM compatible 7-track digital tapes from the IOP.

32. SYSTEM REQUIREMENTS.

a. ICU Project. The key ICU target requirements are:

- (1) Performance - 1565 tracks;
- (2) Functional - FDADs operational in an ARTS IIIA mode, CMA/Core memory replacement with SSM, and increased data blocks;
- (3) Schedule - operational in April, 1988; and
- (4) Implementation - without transition related disruptions.

b. Stage 1 Requirements. The key Stage 1 target requirements are:

- (1) Performance - 1700 tracks;
- (2) Functional - a smart full digital/timeshared display;
- (3) Schedule - operational in August, 1988; and
- (4) Implementation - without transition related disruptions.

c. Stage 2 Requirements. The key Stage 2 target requirements are:

- (1) Performance - 2800 tracks plus a 20% expansion capability;
- (2) Functional - a track-all philosophy, a backup mode for Common Processor (CP) failure, and a System Monitor Console (SMC);
- (3) Schedule - operational in December, 1989; and
- (4) Implementation - without transition related disruptions.

33. INTERFACES.

a. ARTCC-ARTS IIIE Interface. The ARTS IIIE shall interface with one or more ARTCCs. This communication shall include all transmissions and responses performed by the ARTCC that is pertinent to the New York TRACON, including flight plan, track, test, response, and other messages.

b. Surveillance Sites - ARTS IIIE Operational and Physical Interface. The ARTS IIIE shall interface with various types of surveillance facilities. It shall receive target and weather messages from these facilities. The messages contain aircraft beacon code and position, weather location and intensity, and status information. The primary purpose of the data is to enable air traffic controllers to locate targets and hazardous weather areas. The ARTS-IIIE interface with these surveillance facilities will be via the ASR/ATCRBS digitizers. These short-range radar surveillance system interfaces include the Sensor Receiver and Processor (SRAP) and the ASR-9.

c. The primary function of the subsystem interface is to provide two-way communication between all subsystems of the ARTS IIIE system.

(1) For Stage 1 this includes communication between the existing IOPB subsystem and the new Display Processor (DP) subsystem. For Stage 2 it includes communication between the Common Processor (CP) subsystem, the Track Processor (TP) subsystem, the DP Subsystem, and the System Monitor Console (SMC) subsystem. To accomplish this function, the subsystem interface must:

(a) Provide the necessary capacity and connectivity to support the ARTS IIIE normal, fail safe and fail soft modes of operation.

(b) Provide a direct TP to DP interface for backup mode operation when the CP subsystem is down.

(c) Provide the necessary processing, formatting, transmitting, receiving, and decoding capabilities required for inter-subsystem message transfer.

(d) Provide message validation, error detection, and message retransmission capability.

(e) Provide redundancy to accommodate subsystem failure or interface failure.

(f) Provide resource status monitoring, failure detection, and reconfiguration capability.

(g) Provide interface capability to sustain the continuous data recording function during backup mode operation.

(h) Provide capability to transfer command, status, error, and alarm messages between the SMC and all other subsystems.

d. System Support Computer Interfaces. System Support Computer supports the development, test, and evaluation of system modifications and provides centralized national support to the ARTS IIIE. In order to perform these functions effectively, the equipment interfacing to the SSC shall, where appropriate, be identical to those at the NY TRACON. In addition, there shall be several interfaces to equipment unique to the SSC that are used primarily for testing and field support.

34. CONTRACT OPTION.

a. The Remote Full Digital Display (RFDD) Subsystem shall execute the software Display Processing Functions. The RFDD subsystem shall also provide for the display of ATC situation data comprised of alphanumeric, vector and circle data. Data entry information shall be processed and transmitted to the CP as appropriate. The RFDD shall display data which is easily viewable in the high ambient illumination of the airport terminal tower cab.

b. The RFDDs are optional items identified in Contract Line Item Number (CLIN) B.2. If the Government should choose to exercise this option, a

separate negotiation will be required to establish development and production costs. Also, a NAS Change Proposal (NCP) will have to be initiated by AAP-301 to account for the change in NAS architecture.

35.-39. RESERVED.

CHAPTER 4. PROJECT SCHEDULE AND STATUS

40. PROJECT SCHEDULES AND GENERAL STATUS. The contract award date was March 14, 1986. Stage 1 completion date is August 22, 1988; Stage 2 completion date is December 12, 1989. Due to program developments, the ICU project was authorized in order to advance the delivery of FDADs and SSMS. ICU activities are scheduled for completion on May 2, 1988.

41. MILESTONE SCHEDULING SUMMARY. Project milestone schedules are provided in Appendix 2. Appendix 2 provides project dates for the ICU, Stage 1, and Stage 2.

42. INTERDEPENDENCIES AND SEQUENCES. The following projects are directly interrelated with the NY TRACON project.

a. Enhanced Target Generator (ETG) Project: will receive ARTS IIIA displays from NY TRACON. The Displays will be released from NY TRACON project after Stage 1 is completed.

b. Terminal Conflict Alert (CA) Enhanced Project: The NY TRACON Project will use the ARTS IIIA software, A5.05, as a software baseline.

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CHAPTER 5. PROJECT MANAGEMENT

50. PROJECT MANAGEMENT, GENERAL. The overall technical management of the NY TRACON project is the responsibility of the Air Traffic Control Automation Division, AAP-300 and in particular, AAP-301. This organization will accomplish management tasks within the guidelines provided by FAA policies, procedures, and directives. A member of this organization is designated NY TRACON Project Manager and is the single focal point for all project activities.

a. A Contracting Officer (CO), designated by ALG-310, performs the general contract management activities of monitoring Contractor schedules, assessing problem reports and solutions, attending meetings, conducting inspections, conducting in-progress reviews, and all other activities concerned with assuring that the terms of performance under the contract are met. The CO is the only person authorized to make changes that will affect prices, deliverables, or schedules.

b. A Quality/Reliability Officer (QRO), designated by CO is the FAA's representative at the Contractor's facility. The QRO's functions are governed by FAA Quality Assurance policies and procedures, and by the terms and conditions of the contract.

c. The Technical Officer (TO) position will be filled by a representative from AAP-320, and will provide technical guidance and direction to the Contractor within the scope of the contract. The TO will ensure that the Contractor has access to technical documentation, appropriate data bases, and sources of information relative to government furnished equipment (GFE).

d. The Program Manager (PM), for NY TRACON, will be a representative from AAP-301 and will fulfill the following responsibilities:

- (1) Direct and control all NY TRACON Project Activities.
- (2) Prepare the Project Implementation Plan.
- (3) Determine the Project Requirements.
- (4) Build the precedence network.
- (5) Develop the Project Schedule.
- (6) Participate in contract negotiations.
- (7) Ensure availability of funds.
- (8) Keep the project within budget.
- (9) Keep the project on schedule.
- (10) Develop contingency plans.
- (11) Interpret the Statement of Work.
- (12) Secure support services and resource commitments.
- (13) Coordinate all project interfaces.
- (14) Provide a central point of contact for all participants.

e. The Assistant Technical Officer (ATO) position will be a representative from ACT-120. The ATO provides technical support to AAP-320 in resolving design and program issues. In addition, the ATO provides technical guidance to the system contractor.

f. Regional Project Management. The Eastern Region (AEA) will appoint NY TRACON Regional Project Managers for Airway Facilities (AEA-400) and Air Traffic (AEA-510). They ensure that facilities and engineering work is complete prior to the delivery of the NY TRACON equipment. They will monitor the installation of the NY TRACON equipment and coordinate requests for contractual or technical support with AAP-320 and the National Automation Engineering Field Support Sector, ASM-160. The Regional Project Managers will arrange for the appointment of a Technical Representative at the NY TRACON.

(1) AEA-510 will fulfill the following responsibilities:

- (a) The safe and efficient movement of traffic during the implementation of the NY TRACON system into the operational environment.
- (b) Provide membership to Project Implementation and FAATC Integration Groups.
- (c) Provide adequate manning to accomplish training, testing and operational needs during NY TRACON installation.
- (d) Provide inputs to AAP-320 as they relate to regional logistics requirements.
- (e) Provide proper administrative channels of communication to assure AAP-320 full cognizance of status at all times.

(2) AEA-400 will fulfill the following responsibilities:

- (a) Site preparation and monitoring equipment installation per the installation schedule. Coordinate with AAP-320 on any changes to this schedule.
- (b) Provide membership to Project Implementation and FAATC Integration Groups.
- (c) Provide adequate manning to accomplish training, testing and operational needs during NY TRACON installation.
- (d) Develop the required environmental and AS BUILT records.
- (e) Provide inputs to AAP-320 as they relate to logistics requirements.
- (f) Participate in the development of system shakedown test plan.
- (g) Monitor the overall progress of the NY TRACON from site preparation through operational changeover.
- (h) Participate in factory system tests under the direction of the Quality/Reliability Officer (QRO) assigned by the Contracting Officer to the NY TRACON Project.

(i) Establish financial and item management control and accountability for all agency property received in the region.

(j) Provide proper administrative channels of communication to assure AAP-320 full cognizance of status at all times.

g. The FAA Technical Center (FAATC) will provide the support necessary to test and evaluate NY TRACON for functional and operational performance and for compliance with the Specification. The FAATC will perform these duties in accordance with FAA Order 1810.1D. The FAA Technical Center will be the site of the first NY TRACON installation. ACT-120 has the lead responsibility for system acceptance at FAATC for AAP-301. A NY TRACON Test Representative will be appointed from ACT-120 to serve as the lead for integration and system testing and from ASM-160 to serve as the lead for shakedown testing. The test representative will coordinate his activities with the NY TRACON Project Manager, AAP-301.

(1) The FAATC must fulfill the following responsibilities:

(a) Provide membership, as required, to the Configuration Control Board, and other management groups as required.

(b) Establish financial and item management control and accountability for all agency property received at FAATC.

(c) Coordinate with AAP-301 and develop shakedown and integration test plans.

(d) Conduct shakedown testing, with appropriate guidance from AAP-301.

(e) Provide NY TRACON engineering report during testing, integration and deployment.

(f) Provide support to the Eastern region. This support is to be outlined in the Master Test Plan.

(g) Provide operation and maintenance services for the system.

(h) Establish initial training requirements for FAATC personnel and coordinate with ATR-710.

h. System Engineering and Integration Contractor (SEIC) Project Management. The SEIC provides support in accordance with contract DTFA01-84-C-00017, Chapter 10, NAS project Management Requirements, and in accordance with contract DTFA01-86-C-0006, para G. 13, Title "Monitor and Technical Support." These contracts require the SEIC to assist AAP-301 with overall management of the project. Specific tasks include:

- (1) Project Planning.
- (2) Preparation of acquisition packages.
- (3) Evaluation of technical design.

- (4) Subsystem and interface configuration control.
- (5) Project financial management and control.
- (6) Project schedule control.
- (7) Independent Verification and Validation (IV&V). The objective of the IV&V effort by SEIC (Logicon) is to provide an independent assessment of developed software on the NY TRACON project, to ensure that the documented end-product meets the functional specified requirements (Verification) and that the tested end-product meets performance requirements (Validation).
- (8) Documentation control.
- (9) Logistics support analysis.
- (10) Project review participation and project report generation.
- (11) Coordination with the NY TRACON contractor.
- (12) Test planning, coordination, and observance.

51. PROJECT CONTACTS. The individuals who are responsible for the direction and successful completion of the NY TRACON Project are listed in Appendix 3.

52. PROJECT RESPONSIBILITY MATRIX.

Table 5-1. Project Responsibility Matrix

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● = Indicates Office of Primary Responsibility.

o = Indicates Support Responsibility.

53. PROJECT MANAGERIAL COMMUNICATIONS. Project managerial communication is provided bimonthly to APS-1 and ADL-1 through a Program Status Review Board (PSRB). This PSRB provides insight into cost, schedule, technical, and logistics issues that may exist. Communications between the FAA and contractor program managers is accomplished through various contractually mandated vehicles. These methods include the following:

a. Project Status Report - Monthly. A contractor provided document designed to apprise the Government of the Contractor's assessment of contractual effort as of the date of the report.

b. Cost/Schedule Status Report - Monthly. A contractor produced document delivered to the Government to review cost and schedule status of all authorized contract work performed as of end of calendar work reported.

c. Weekly Status Major Problem Report - Weekly. A deliverable which informs the FAA of major problems, especially those requiring FAA assistance, resolution, or action. It also assures that the contractor's line management is aware of major problems.

d. Request for Action - As required. Whenever there is a need for official Government response by the Contractor, a Request for Action (RFA) form shall be completed and transmitted to the Government. An RFA is used to obtain information, clarification, or decision regarding technical, administrative, or contractual issues. It is also used to formally request permission to visit Government facilities.

e. Monthly Project Management Review Meeting - Monthly. A contractor-hosted review of project status in terms of schedule, performance, and cost. This meeting serves as a Government/ contractor forum to address problem areas and assign action items for problem resolution.

f. Government Pre-review Meetings - As required. Meeting of applicable government parties, prior to each major project review, to discuss government position and review objectives.

g. Technical Interchange Meetings (TIM) - As required. TIMs will be held with the appropriate parties in order to discuss/resolve project issues, problems, or when specific contractor guidance is required.

h. Document Distribution. After receipt of an incoming document, that document shall be made available for distribution to designated reviewers, both critical reviewers and information only designees. Distribution of contract deliverables shall be in accordance with the CDRL Distribution matrix. Document recipients shall be notified by phone that the document has been submitted by the Contractor and is in distribution.

i. Collation of Comments. Comments from all FAA designated reviewers shall be directly submitted to the Data Manager for evaluation within the established internal review system. The Data Manager shall coordinate all comments with the appropriate authorities and document reviewers. Review findings shall be delivered to the Technical Officer.

j. Comments to Contractor. The FAA TO shall review all comments submitted against the applicable document and accept or reject them. The comments are then reviewed with the Project Contracting Officer. Approved comments are submitted to the Contractor for incorporation into the final document.

54. PLANNING AND REPORTS.

- a. Configuration Status Accounting Report.
- b. Project Status Report.
- c. Cost/Schedule Status Report.
- d. Weekly Status and Major Problem Report.
- e. CDRL Distribution Matrix.

55. CONFIGURATION MANAGEMENT. Configuration Management (CM) is the process used to identify and document the functional and physical characteristics of a configuration item, control changes to those characteristics, and record and report change processing and implementation status.

a. CM shall be applied to all configuration items included in the NY TRACON baseline to ensure compatibility. All changes to the NY TRACON baseline shall be proposed in the form of program technical reports and case files, and shall be reviewed for recommended approval or disapproval by a Must Evaluation (ME) Configuration Control Board (CCB).

b. During the operational support phase, and for the entire life-cycle of the hardware and software, CM functions will consist of maintenance and change control management of site and product baseline. Hardware and software CM processes are describe below.

(1) Hardware CM - The CCB assumes baseline and change management of all hardware procured under this contract. All products and associated peripherals will be commissioned for operational service via a Memorandum of Agreement (MOA). The ME CCB is responsible for change control management of the NY TRACON ICU, Stage 1, and Stage 2 hardware product baselines per MOA. NAS MD-001 baselines are prepared and maintained by AES-410. Engineering changes are submitted, via casefiles, to ATR-100 for pre-screening. ATR-100 shall evaluate the changes and forward to AES-410 for ME. AES-410 will consolidate the ME comments, assign an NCP number, prepare a Configuration Control Decision (CCD) and present it at the ME Board. The directed action will be accomplished with notification to AES-410 when completed. AES-410 will log and close NCP.

(2) Software CM - The AT CCB assumes change control management of NY TRACON ICU, Stage 1, and Stage 2 operational software baselines, and is responsible for ensuring the integrity of the operational software and required support throughout it's life cycle. NAS MD-001 baselines are prepared and maintained by AES-410. Engineering changes are submitted, via casefiles, to ATR-200 for pre-screening. ATR-200 shall evaluate changes and forward to AES-410 for ME. AES-410 will consolidate the ME comments, assign an NCP number, prepare a CCD and present it at the AT Board. The directed action will be accomplished with notification to AES-410 when completed. AES-410 will log and close NCP.

56. APPLICABLE DOCUMENTS. See Appendix 4.

57.-59. RESERVED.

CHAPTER 6. PROJECT FUNDING

60. PROJECT FUNDING STATUS, GENERAL. The NY TRACON contract (DTFA01-86-C-00006) was awarded to Sperry Corporation on March 14, 1986. This contract is a cost plus incentive fee/firm fixed price (CPIF/FFP) with an original value of \$45.608M.

a. The FFP portion of the contract includes CSD hardware (Stage 2), magnetic tape controller, Sperry personal computers, spare parts, training, and a provisioning conference.

b. A financial report, which provides status of project funding, is provided in Figure 6-1. Due to the changing nature of funding data, the data provided in Figure 6-1 is dated as of September 28, 1987.

61.-69. RESERVED.

Figure 6-1. NY TRACON Project Funding Status**FUNDING SOURCES:**

F & E FUNDS:	FUNDING AMOUNT	ADJUSTMENTS	NET CHANGE
4026-500.82	0	7,601,917	7,601,917
4026-567.82	0	75,000	75,000
4024-501.86	31,400,000	550,000	31,950,000
4024-501.87	15,000,000		15,000,000
TOTAL F & E	46,400,000	8,226,917	54,626,917
DOD FUNDS:			
TOTAL DOD	0	0	0
TOTAL PROJECT FUNDS	46,400,000	8,226,917	54,626,917

EXPENDITURES:	CONTRACT NO.	F & E	REIMBURSABLE	TOTAL
OFF THE TOP		-2,175,300	0	-2,175,300
CONTRACT 1 AWARD	81-C-10097	0	0	0
CONTRACT 1 MODS		-50,000	0	-50,000
CONTRACT 2 AWARD	81-C-20010	0	0	0
CONTRACT 2 MODS		0	0	0
CONTRACT 3 AWARD	86-C-00006	-33,575,000	0	-33,575,000
CONTRACT 3 MODS		-12,153,112	0	-12,153,112
TOTAL CONTRACT FUNDING				-45,778,112
TECH CNTR/ACADEMY SUPPORT		-459,500	0	-459,500
REGIONAL TRANSFERS		-550,000	0	-550,000
SEI SUPPORT		-1,188,710	0	-1,188,710
MITRE SUPPORT		-97,039	0	-97,039
TRAVEL		-88,695	0	-88,695
ACCOUNTING ADJUSTMENTS		0	0	0
MISC. H/W CHARGES		0	0	0
MISC. S/W CHARGES		0	0	0
TRAINING		0	0	0
SPARES		0	0	0
ENGINEERING SUPPORT		-5,400	0	-5,400
OTHER		0	0	0
TOTAL PROGRAMMATIC COSTS				-2,389,344
TOTAL EXPENDITURES				-50,342,756
UNOBLIGATED BALANCE				4,284,161
INTRANSIT ITEMS		-4,095,845	0	-4,095,845
REMAINING AVAILABLE BALANCE				188,316

CHAPTER 7. DEPLOYMENT

70. GENERAL DEPLOYMENT ASPECTS. Although the New York TRACON project is limited to a single operational field site, the project deployment scheme is rather complex. Various elements of the project will be produced at Clearwater, Florida; Fort Wayne, Indiana; Ottawa, Canada; and St. Paul, Minnesota. The production units will be integrated into systems at the Sperry ATC Test Bed Facility (located in the FAA Building at the Minneapolis-St. Paul International Airport), the FAA Technical Center (FAATC), and the NY TRACON.

a. The Minneapolis-St. Paul (MSP) Test Bed will be used to facilitate NY TRACON hardware development and checkout. IOPBs, displays, and interfaces to the radar-beacon video lines necessary to test and develop automated ATC system hardware are in place.

b. Prior to and during the site installation at FAATC and NY TRACON, the MSP test bed will be used as a prestaging facility with a scaled down development system. This test bed will enable comprehensive lower level testing of hardware and software units and, in some cases, HWCIs and CSCIs. It is important to note that some hardware components will be shipped to the sites from the test bed. Thus, production equipment from both Stage 1 and 2 may have been tested in a live radar environment.

c. Each of the two stages will first be implemented at the FAATC to verify installation, system integration, and testing methodology prior to deploying the configured system to NY TRACON. The FAATC system is required to be identical to the NY TRACON system except for the number of displays. This FAATC support system will remain in place subsequent to NY TRACON ARTS IIIE certification.

d. The complexity of the deployment scheme is compounded by the fact that the FDADs are sophisticated "SMART" display devices which require stabilization and validation before being integrated into an operational system. This factor will be resolved by performing a "burn-in" of the FDAD circuitry at several points throughout the deployment cycle. The intent of this FDAD burn-in is to limit integrated circuitry "infant mortality" (failure of devices during initial power on) to the non-operational environment and to stabilize the display circuitry. Each FDAD will pursue the following path:

(1) Factory Acceptance Testing (FACT) of FDAD display circuitry will verify specification compliance. This FACT will include a 72 hour Burn-In Test. The FDAD Display Processor (FDP) will be integrated into the Basic FDAD (BFDAD) at Magnavox Facilities prior to FDAD shipment. This integrated FDP/BFDAD device is collectively considered an FDAD.

(2) During the ICU project, three FDADs will be delivered to the MSP Test Bed and will be used to support further testing. 12 FAATC prototype FDADs and 37 production NY TRACON FDADs will be delivered directly to the sites. The three MSP Test Bed FDADs will remain in place to support Stage 2. Between Stage 1 and 2, three additional FDADs will be delivered to the MSP Test Bed to support Stage 2 integration. The remaining nine NY TRACON FDADs will be deployed directly to the NY TRACON. At the completion of Stage 2 integration, the six MSP Test Bed FDADs, along with MSP Test Bed production items slated for site deployment, will be delivered to the NY TRACON.

(3) Upon reaching the site (FAATC or NY TRACON), the FDADs follow a three step stabilization procedure. The following steps are the planned procedure for installing FDADs and are subject to modification at the time of INCO.

(a) First, the FDAD will be uncrated at a staging area and internal cables will be connected. The FDAD will then be checked out and powered up. At this point, digital circuitry will be aligned and calibrated. This procedure will require approximately 24 hours.

(b) Second, the FDAD will be powered down, moved to the proximity of the training system, and external interface cables will be connected. The FDAD will again be checked out and powered up. At this point, analog video circuitry will be aligned and calibrated and a preliminary Program Operational Functional Appraisal (POFA) will be performed.

(c) Third, the FDAD will be powered down, moved to the operational position, exchanged with the old display, and external cables connected. Again the FDAD will be checked out and powered up. The final POFA will be performed and any final stabilizing problems resolved. This third step is predicted to require 30 minutes. At this point, the display will have been electronically checked out, totally aligned, and completely stabilized. In addition, all display interface communications will have been fully verified and the new FDADs will be ready to be certified and integrated into the existing on-line FAA operational system.

71. SITE PREPARATION.

a. Two FAA facilities must be prepared for ARTS IIIE deployment these are FAATC, and the NY TRACON. In addition, the MSP Test Bed will be prepared and used for integration and test activities. Site preparation activities are planned and scheduled to support the overall implementation of the ARTS IIIE while avoiding interference with ongoing ATC support functions. Responsibility for the overall management of site preparation activities resides with AAP-320. Additional roles and responsibilities are defined below.

b. Sperry's MSP Test Bed facility is located in the FAA building and Annex at Minneapolis-St. Paul Airport. Of the 2,040 square feet allocated to the test bed facility, 1,740 square feet will be dedicated to NY TRACON. The necessary tie-ins to radar/beacon video are currently in place. Adjacent to the test bed facility will be an assembly area for the off-the-shelf equipment.

c. All site preparation issues concerning the MSP test bed facility non-configured items will be coordinated and resolved directly between Sperry and MSP Airport. The site preparation activities for the ARTS IIIE system at FAATC will consist of a preliminary site inspection, an initial site survey, installation planning, FAA site preparation, and final site surveys. The physical space within the FAATC is limited and, as such, places certain constraints on the ARTS IIIE implementation, i.e.,

(1) No additional space beyond that which is currently available within the equipment area of the ARTS laboratory will be provided; and

(2) The FAA shall not be required to relocate its equipment currently in place. The single exception to this constraint shall be the case of equipment replacement, i.e., displays.

d. The ARTS IIIE and equipment will be housed in the FAATC in accordance with following paragraphs.

(1) Facility access is provided in accordance with FAA Technical Center Plot Plan and Architectural Drawing from Contract 10 Atlantic City Improvement Authority (ACIA), sheets 106 through 109 and any officially approved modifications or revisions.

(2) The FAA will provide interior building space for offices, training, and maintenance support in accordance with standard space allocation formulas as specified in Title 41, Code of Federal Regulations, Federal Property Management Regulations, Part 101 and FAA Order 4660.1. Furnishings for this space will also be in accordance with these documents. Heating, ventilation, air conditioning (HVAC) and other environmental controls (e.g., humidity and air filtration) will be provided in accordance with the following Technical Center documentation: Contract Number 11 HVAC and piping drawing ACIA sheets 303 through 306, 320 through 323 and any officially approved building and equipment modifications and drawing revisions. The contractor will identify any physical plant requirements which are not currently provided by the FAA.

(3) All control and equipment room locations will be provided with electrical power, lighting, and water in accordance with the following technical center documentation: Contract Number 13 Lighting and Power Drawings ACIA sheets 416, 418, 421, 4232, 438, 441, 481 through 484; Contract Number 17 ACIA sheet 424; Contract Number 12 Plumbing Drawings ACIA sheets 503 through 506; Sprinkler System Drawings ACIA sheets 603 through 606; and any officially approved building and equipment modifications and/or drawing revisions. The Contractor will identify any utility requirements which are not currently provided by the FAA.

(4) The FAA will provide special facility equipment not specified in the preceding paragraphs (such as grounding, lighting and surge protection, and security systems) in accordance with the following Technical Center Documentation: NASP-5204-01 Volumes I and II, Contract Number 13 Equipment Grounding Drawings ACIA sheet 474 and any officially approved building and equipment modifications and drawing revisions. The contractor shall identify any requirements for special facility equipment which is not currently provided by the FAA.

e. To ensure that the FAATC and NY TRACON is ready to accept the ARTS IIIE equipment on schedule, the contractor conducted a pre-contract site inspection per RFP L.19. These preliminary site inspection activities were primarily designed to allow the contractor to determine initial installation requirements.

f. The FAATC and NY TRACON AF Divisions will designate resident engineers to be responsible for managing and coordinating the FAATC site preparation activities. These activities include: providing regional engineering services for change order submittal, review of site survey reports, coordination of site preparation work, and acceptance of completed site. The resident engineer will advise AAP-320 of any additions or changes to the site preparation activities that would justify additional funding so that approval and allocations can be made. The resident engineer will provide periodic status reports via telecon to the Technical Officer.

g. The contractor will perform a Preliminary Site Survey at the FAATC. The purpose of this activity is to determine the availability and adequacy of environmental and physical facilities for the ARTS IIIE and to establish a software baseline including local adaptation data and patch level. The contractor will identify any environmental or physical factors which would cause difficulty during installation of the ARTS IIIE and make recommendations for alleviating the problems. The results of this Preliminary Site Survey will be documented by the contractor in a Site Survey Report and delivered to AAP-320 and ACT-620 no later than 15 days after completion of the Preliminary Site Survey.

h. Upon completion of the Preliminary Site Survey, the contractor will initiate installation planning. Contractor personnel will prepare detailed plans, specifications, and engineering drawings to enable the FAA to prepare the site for ARTS IIIE installation. To facilitate the FAA site preparation effort, the contractor will deliver the following documents per the CDRLs and the Deliverable Item Schedule:

- (1) CDRL-E-022, Interface Design Documents
- (2) CDRL-E-040, Engineering Drawings
- (3) CDRL-E-048, Interface Control Documents

i. FAATC site preparation activities will begin approximately 45 days after contract award. While the FAA prepares the site, the contractor will review Government-furnished architecture and engineering documents to ensure that equipment locations, cabling, power connections, lighting, HVAC, and other physical requirements are adequate for ARTS IIIE installation. Any problems or differences in requirements will be resolved by review with AAP-320 and ACT-620.

j. No later than 30 days prior to the Stage 1 FAATC Preship Review (PSR), the contractor will conduct a Final Stage 1 Site Survey. This activity will ensure that the FAATC is ready to receive the equipment. The results of the Final Stage 1 Site Survey will be documented by the contractor and delivered to AAP-320 and ACT-620 no later than 14 days after completion of the site survey. Any problems which arise will be solved before Stage 1 installation proceeds.

k. In parallel with or subsequent to Stage 1 site preparation activities, the FAA will perform those site preparation activities necessary to support Stage 2. When the FACT is approved the contractor will conduct a Final Stage 2 Site Survey. This activity will ensure that the FAATC is ready to receive the Stage 2 equipment. Distribution of the Final Stage 2 Site Survey Report

will be identical to Stage 1 (including schedule). Any problems which arise will be solved in the same manner as in Stage 1.

1. The site preparation activities for the ARTS IIIE system at the NY TRACON will follow a similar path to that of FAATC. The NY TRACON is under the same physical space limitation as the FAATC and is therefore under the same constraints.

m. The ARTS IIIE and equipment will be housed in the NY TRACON in accordance with the following paragraphs.

(1) Facility access is provided in accordance with the NY TRACON Plot Plan and FAA Regional As-Built Standard Drawing Series and any officially approved modifications or revisions.

(2) The FAA will provide interior building space and furnishings in accordance with the same space allocation formulas as specified for the FAATC. Heating, ventilation, air conditioning (HVAC) and other environmental controls (e.g., humidity and air filtration) will be provided in accordance with FAA Regional As-Built Standard Drawing Series D-5906, E-5896, FAA Order 6480.7 and any officially approved building and equipment modifications or drawing revisions. The contractor will identify any physical plant requirements which are not currently provided by the FAA.

(3) All control and equipment room locations will be provided with electrical power, lighting, and water in accordance with FAA Regional As-Built Standard Drawing Series and officially approved building and equipment modifications and drawing revisions. Personnel offices, training, and maintenance support space will be provided with 120-volt AC, 60-Hz power receptacles, lighting, and adequate water and water closet facilities. Lighting and power will be in accordance with Occupational Safety and Health Standards. The contractor will identify any utility requirements not currently provided by the FAA.

(4) The FAA will provide special facility equipment not specified in the preceding paragraphs such as grounding, lighting, surge protection, and security systems for the ARTS IIIE in accordance with FAA Regional As-Built Standard Drawing Series and any officially approved building modifications or drawing revisions. The Contractor will identify any requirements for special facility equipment which is not currently provided by the FAA.

n. The NY TRACON requirements for Preliminary Site Survey, installation planning, and site preparation activities are identical to the FAATC except for location, schedule, and site personnel involved. Site Survey Reports will be delivered to AAP-320, AEA-400, and NY TRACON AF (AFSFO 841.1). Any site preparation problems will be resolved with these same organizations.

o. The Final Stage 1 Site Survey for NY TRACON will occur immediately following the FAATC Final Stage 1 Site Survey. The distribution of the report will be identical to the preliminary site survey report (but no later than 14 days after completion of the site survey). The Final Stage 2 Site Survey for

NY TRACON will occur after the Stage 2 FACT is approved. The distribution of the Final Stage 2 Site Survey report will be identical to the Final Stage 1 Site Survey report (including schedule). Any problems which arise will be resolved in the same manner as Stage 1.

72. DELIVERY. The contractor will deliver ARTS IIIE equipment to the MSP Test Bed, FAATC, and NY TRACON. Delivery and deployment activities will be planned and scheduled to avoid interference with ongoing ATC support functions. Responsibility for the overall management of ARTS IIIE delivery activities resides in AAP-301. Additional roles and responsibilities are defined below.

a. Although equipment delivery to the MSP Test Bed is a contractor-internal activity, it will be tracked by ARTS IIIE project management to ensure accurate statusing of contract progress. Three FDADs delivered to the test bed and will be used to support other testing; thus, indirectly, they will be tested at the test bed. The TP subsystem to be produced at the contractor's facility in Clearwater, Florida, is identical to hardware at the NY TRACON, and will have undergone assembly level testing at Clearwater.

b. The MSP Test Bed will also be the site of Factory Acceptance Testing (FACT). The description of the activity can be found in Chapter 8 - Verification, paragraph 80 - Factory Testing.

c. The following Government Furnished Equipment (GFE) will be required at the MSP test bed:

(1) Stage 1.

(a) 1-IOPB with Breakpoint Module (BPM), Channel Back to Back Switch, and cables.

(b) 4-16K Memory Modules with cables.

(c) 2-BRITE Alpha-Numeric Subsystems (BANS) with cables.

(d) 2-Processor Cabinets (PCABS).

(e) 1-Multiplexed Display Buffer Memory with cables.

(2) Stage 2.

(a) 2-BANS with cables (retain items above).

(b) 3-PCABS (retain PCABS above plus one).

(c) 6-FDADs (retain production units).

e. The contractor will determine and control the delivery schedule of production equipment to the MSP Test Bed. The single forward schedule constraint is that the MSP delivery and installation schedule not impact the accomplishment of Stage 1 and 2 FACT Testing at the MSP Test Bed. The contractor will provide periodic statusing of MSP Test Bed activities to AAP-301.

f. FAATC delivery activities fall into 2 categories:

- (1) Site Readiness Inspection; and
- (2) Transportation and Handling

g. The Site Readiness Inspection activities are final checks to ensure that the FAATC is ready to accept the ARTS IIIIE equipment. These activities take place on-site and occur after the Final Site Survey and before equipment arrival. The FAATC Site Readiness Inspection sequence will occur as follows:

(1) APM-320, ACT-620, and contractor representatives will conduct a Site Readiness Meeting. At the meeting, program personnel will review the FAATC Installation Plan (CDRL-E-010), schedule the site predeployment survey, and schedule pretesting of existing ARTS hardware.

(2) ACT-620 and contractor representatives will conduct the Site Predeployment Survey. Here, program personnel will identify office space, equipment staging areas, equipment receiving areas, verify that power is installed, and verify ground connections. In addition, program personnel will verify that all action items from the Final Site Survey have been satisfactorily resolved. Any remaining open issues will be resolved prior to arrival of equipment. The contractor will provide a Site Predeployment Survey Report to AAP-320 and ACT-260 outlining the results of the survey.

(3) ACT-620 (witnessed by contractor personnel) will test existing ARTS IIIA hardware for conformity to project specifications. The methods utilized will include diagnostics, Factory Acceptance Test Procedures, Programmed Operational and Functional Appraisals (POFA), and/or operational programs. Any discrepancies will require repair and retest of the hardware prior to arrival of ARTS IIIIE equipment.

h. Transportation and Handling activities are those actions directly involved in shipment of ARTS IIIIE equipment. These activities occur after FAA approval of FAATC Preship Review (PSR) and conclude with receiving and inventory of the ARTS IIIIE equipment. The FAATC Transportation and Handling sequence will occur as follows:

(1) One day prior to the ARTS IIIIE equipment's on-site arrival, the Contractor's Installation Team shall arrive. This contractor team will then conduct a final site briefing for the FAA. The purpose of this briefing is to advise the FAATC personnel of the status of the implementation and coordinate any remaining issues which could impact ARTS IIIIE deployment.

(2) The contractor will give prior notice, via TWX, to AAP-320 and ACT-620 of impending shipment of ARTS IIIIE equipment. The shipping notice will define the equipment being shipped, the origin and destination of the shipment, and the expected arrival date at the site. The Contractor will advise AAP-320 and ACT-620 by the most expeditious method of any significant delays or other significant incidents that will impact scheduled deliveries.

(3) ARTS IIIE equipment will arrive in tractor trailers. Space must be allowed for these trucks to stage their deliveries and loading dock space must be available. Additional space will be required for the installation team to park their vehicles. The names of the members of the installation team will be provided to ACT-620 to arrange entry and security. The ARTS IIIE will be protected by shipping containers, packing and braces. Provisions should be made by the FAATC to dispose of this large volume of material.

(4) The contractor will unpack all equipment for FAA inspection, and will inventory against the master invoice.

(5) All items will be put in place or in the applicable staging area by the Contractor as defined by the FAATC installation plan.

i. The Stage 1 equipment to be delivered to the FAATC is identified in the FAATC Installation Plan (CDRL E010, ATC 31036). In addition to the hardware deliveries, the contractor will deliver the following items for each stage of the implementations.

- (1) All test and support equipment.
- (2) All test and support software.
- (3) Maintenance Test and Support Equipment.
- (4) Maintenance Software.
- (5) Special Tools.
- (6) Operational software (including Version Description Documents (CDRL-E-046) as required).
- (7) Sets of documentation to support items 1 through 6.

j. The ARTS IIIE areas must be secured during the implementation period to provide storage space for test equipment, tools, documentation, and related support material. NY TRACON delivery activities are identical to FAATC delivery activities with the following exceptions:

- (1) Reference to FAATC will be NY TRACON.
- (2) References to ACT-620 will be AFSFO 841.1.
- (3) Reference to FAATC Installation Plan (CDRL-E-010) will be NY TRACON Installation Plan (CDRL-E-011).
- (4) NY TRACON will require a slightly different equipment delivery. Stage 1 equipments to be delivered to the NY TRACON are identified in the NY TRACON installation plan (CDRL E011, ATC 31047).

73. INSTALLATION PLAN. This section delineates the FAA responsibilities for verifying the proper Installation and Checkout (INCO) of the ARTS IIIE and includes the initial phase of Site Acceptance Testing. The contractor will perform Installation and Checkout in accordance with the FAATC Installation Plan (CDRL-E-010) and the NY TRACON Installation Plan (CDRL-E-011).

a. In addition to the FAATC and NY TRACON, the contractor will install and checkout ARTS IIIE equipment at the MSP Test Bed. However, this is a contractor internal activity and, as such, will not be covered by this document.

b. Installation tasks place the equipment in its operational configuration, but do not include the application of power. Checkout activities include adjustments for environmental control equipment and the execution of functional and diagnostic tests which form the Installation and Checkout phase of site acceptance testing. All checkout testing of the installed ARTS IIIE will be conducted with standard contractor maintenance diagnostic programs in accordance with the Installation Plan (CDRL-E-010 or CDRL-E-011). The test include element tests, hardware subsystem tests, and hardware system tests. Electrostatic Interference (ESI) tests will be conducted at FAATC and will be conducted at the NY TRACON at the discretion of AFSFO-841.1. During the contractor's checkout activities, ACT-620/AFSFO-841.1 must ensure that a site electrician and HVAC technician are available in the event of an environmental equipment failure. ACT-620/AFSFO-841.1 will monitor the contractors checkout activities.

c. Installation and Checkout activities begin with delivery of the ARTS IIIE equipment and end with the successful completion of the Quality Assurance Inspection. INCO efforts will be accomplished by the Contractor's installation team. At the completion of INCO, the applicable ship and install milestone will be satisfied.

d. Emplacement of the ARTS IIIE equipment will entail moving the equipment from the unloading or staging area to its final location within the site and will be the responsibility of the Contractor. The Contractor will also be responsible for positioning furnishing and floor protection covering prior to emplacing the ARTS IIIE equipment. Any special handling equipment will be provided by the Contractor. The emplacement routes will have been established in advance, and any necessary actions will have been taken by ACT-620/AFSFO-841.1 and the Contractor to assure trouble-free movement of equipment.

e. The equipment installation tasks will include removal of any shipping brackets or tie-downs, adjusting the leveling pads so that the units rest solidly on the floor, and connecting the equipment to the appropriate power panels. Any printed circuit boards which have been shipped separately will be installed. Any power transition switches are part of the NAS once installed and connected to the critical power bus.

f. The contractor will install all ARTS IIIE intra-system cables, all cables to transition switches, and the IEEE 802.3 Network. All cables which are not installed under the floor must be neatly routed and dressed.

g. The contractor will ensure that the equipment is in its final self-contained configuration (without interface to the GFE) and that the ARTS IIIE equipment and operation floor area is cleaned up and put in a normal operational condition for checkout. ACT-620/AFSFO-841.1 is responsible for ensuring that no government property has been damaged by the Contractor during installation of the ARTS IIIE.

h. The contractor will check the ARTS IIIE equipment to ensure that the application of power will not cause damage to the equipment. All switches and circuit breakers will be examined for proper power-up positions, and the cooling air system will be checked for proper operation. ACT-150 is responsible for confirming that no power or HVAC requirements are violated during installation and testing at FAATC. AAP-320 and ACT-150 will enforce the power and HVAC constraints and requirements as specified in FAA-G-2100C.

i. ACT-620/AFSFO-841.1 will ensure that the Contractor notifies the appropriate site personnel prior to the application of power and that no power is applied without site approval.

j. Initial power-on checks will demonstrate that all required functions are available, that current loads are as expected, and that the system is in a condition to permit the loading and exercise of diagnostic software.

k. During full power conditions on the ARTS IIIE, AF personnel will monitor the air temperature, air flow, and relative humidity and will adjust the air handling system to assure that the environmental conditions stay within the specified limits. This monitoring and adjusting will continue as necessary until checkout is complete. HVAC balancing at the completion of installation will be done by the region or contracted out.

l. The individual units of the ARTS IIIE will be inter-connected as subsystems and tested with internal diagnostics. The subsystems will then be inter-connected into the ARTS IIIE configuration as identified in the applicable Installation Plan (CDRL-E-010 or CDRL-E-011).

m. All test results will be recorded for subsequent analysis and verification. Selected tests results from informal site tests may be carried forward to satisfy requirements for the operational site acceptance tests if they have been witnessed and certified by appropriate FAA personnel.

n. Verification of the ARTS IIIE installation is the initial phase of the site acceptance testing and will be witnessed by the appropriate FAA personnel. The ARTS IIIE will be inspected against the applicable installation drawings and specifications to ensure that all tasks have been completed satisfactorily, that all system functions are available and that all required items and documentation have been supplied and installed correctly.

o. A formal meeting will be convened by the Contractor at the completion of the site acceptance tests performed during Installation and Checkout. Site personnel will confirm that all required installation, inspections, and tests have been completed, that all test results are within specifications, and that all materials and services required for this phase have been delivered. Acceptance of the ARTS IIIE installation by the FAA personnel will indicate acceptance of the ARTS IIIE hardware from the Contractor, approve the ARTS IIIE for connection to the GFE, and initiate the Contractor's integration and testing activities.

p. Documentation regarding this event will be required for the final Joint Acceptance Inspection (JAI). The Contractor will include the results of Installation and Checkout in the System On-Site Acceptance Test Report (CDRL-E-034).

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CHAPTER 8. VERIFICATION

80. FACTORY TESTING.

a. Factory Acceptance Testing (FACT) will be comprised of formal tests performed at the contractor's site/test bed. The successful completion of FACT is the criterion for shipment of the system to the FAATC, at which time the contractor will begin INCO and integration testing. The successful completion of the system testing at the FAATC is the criterion for shipment to the NY TRACON.

b. FACT will be conducted on all hardware configuration items (HWCI). Design qualification testing will be performed on all new hardware configurations. For Stage 1, design qualification testing will be accomplished on the BFDAD, SSM, FDP, LBP, RBP, NIA, and the ATC rack. During the BFDAD FACT, a computer software configuration item (CSCI) will be tested as well. This CSCI is the stroke display controller (SDC). A detailed breakdown of what FACT will be accomplished for Stage 2 is not yet available; however, this information will be included in Stage 2 CDRL delivery E-009 (System Integration and Test Plan).

c. Type testing will be performed on one unit of each new HWCI. Production testing will be run for all new HWCI's. Procedures and guidelines for accomplishing FACT are governed by FAA-G-2100C. Specific milestones for this test activity can be found in Appendix II of this document.

81. CHECKOUT. This is the first stage of on-site testing. The purpose of this checkout is to verify system integrity prior to an interface with any external equipment.

a. Checkout will include adjustments to environmental control equipment and the execution of functional diagnostic tests which demonstrate that the system is ready for subsequent software installation and testing. The subsequent test categories are:

- (1) Element Tests.
- (2) Hardware Subsystem Tests.
- (3) Hardware System Tests.

b. Hardware System Tests will include RMA analysis and EMI/ESD Tests. The system will be checked to ensure that application of power will not cause any damage to the equipment. All switches and circuit breakers will be examined for proper power up positions, and the cooling air system will be activated and checked for proper operation. Other tests which will be run include measurements to verify appropriate isolation among various AC and DC power distribution networks within the computer and resistive measurements of the loads that will be drawn from the prime power source. These measurements will be performed before prime power is applied to the system. Application of power will be fully coordinated with the appropriate site personnel. No power will be applied without prior site approval.

c. Initial power-on checks will demonstrate that all required functions are available, that current loads are as expected, and that the system is in a condition to permit the loading and exercise of diagnostic software.

d. During application of full power on the system, the air temperature, air flow, and relative humidity will be monitored continuously. Adjustments will be made to the air handling system by building facilities personnel to ensure that environmental conditions stay within the specified limits as the heat load from the computer varies during power on sequencing. Monitoring and adjustments will continue as necessary until checkout is complete.

e. The basic performance characteristics of the installed ARTS IIIE system will be tested by the use of selected diagnostic programs provided by Sperry, and applicable FAA tests. Diagnostics used for these tests will be included with those delivered with the system. All tests results will be recorded for subsequent analysis and verification. Additional information related to checkout activities can be found in Chapter 73.

82. CONTRACTOR INTEGRATION AND TESTING.

a. This section defines the tasks necessary for integration and testing of the ARTS IIIE system. This testing will verify the performance of the ARTS IIIE system when it is interfaced with other site equipment. Sperry will perform this testing to demonstrate and ensure that the system can perform the functions required to support the NY TRACON operation. The integration and testing phase of the site implementation will demonstrate and document by means of test data that system performance, and the site-adapted software meets contractual requirements.

b. Sperry will conduct integration and testing in accordance with the Site Integration Plan approved by the FAA. The ARTS IIIE will not be used for air traffic control during the system integration and test phase. During periods of ARTS IIIE testing (scheduled for off-peak hours at the NY TRACON), air traffic control will be performed through the use of broadband video.

c. System acceptance testing will be performed at the sites by Sperry in accordance with the Site Integration Plan. The following list of tests will be performed during Stage 1 acceptance testing:

FAATC SOST

CDT Entries
Enhanced Target Generator
Keyboard Functions
CDR Extraction
Tracking
Capacity
First Level Backup
Remote Tower Display Subsystem
Confidence/Stability
(72 hours)

NY TRACON SOST

CDT Entries
Enhanced Target Generator
Keyboard Functions
CDR Extraction
Tracking
Capacity
First Level Backup
Remote Tower Display Subsystem

83. CONTRACTOR ACCEPTANCE INSPECTION. Following the completion of contractor system acceptance testing an inspection will be conducted. This inspection will consist of a review of all test data and system performance observations that were accumulated during the formal acceptance testing conducted by the contractor. The results of this inspection will form the basis for an official FAA determination on whether or not to accept the system at the site.

84. FAA INTEGRATION AND TESTING (I&T).

a. This section defines the tasks necessary for FAA integration and testing of the NY TRACON software to be used for operational shakedown. It also provides guidance for validation of operations and maintenance procedures, and delineates the criteria that must be met to declare IOC.

b. Many of the FAA I&T activities can be performed on the system without affecting ATC operations. However, some activities will affect on-line ATC activities. During these times, ATC operations will have to be switched to broadband video. For this reason, FAA I&T activities affecting on-line ATC operations will be scheduled for periods of light operational activity such as midshifts or evenings. At the completion of test activities, the system will be reconfigured into the ARTS IIIA system, certified, and brought on-line for ATC operations. The operational transition from broadband operations back to ARTS IIIA will complete the test period.

c. The NY TRACON software for operational shakedown must be certified by the FAA for use in a live air traffic environment. The version of the NY TRACON software to be used will be provided by the FAATC. Site AT personnel, supported by the contractor, will site-adapt the software and incorporate any site patches required. When the operational software has been built, it will be subjected to the functional baseline test. Any unexpected or abnormal occurrences must be documented and resolved prior to IOC.

d. Implementation of the NY TRACON system will introduce new operations and maintenance techniques to the site. FAA personnel must establish procedures to isolate ARTS IIIE related problems from the remainder of the site equipment, initiate the appropriate corrective action, and monitor the Sperry corrective maintenance activities. In addition, existing operations, maintenance, and support procedures for hardware and software must be evaluated to determine their impact on NY TRACON operations, and revised procedures must be implemented. These procedures must be incorporated into existing FAA documentation and validated prior to IOC.

e. The AF Sector Manager and the AT Facility Manager must ensure that operations and maintenance personnel have received the appropriate certification prior to IOC. The FAA will declare IOC when the NY TRACON is physically and functionally ready for operation in a live air traffic environment. The declaration will be made jointly by AT and AF managers along with the responsible FAA Headquarters and Regional personnel. A partial Joint Acceptance Inspection (JAI) will be held at this time. In order to declare IOC, the following criteria must be met:

- (1) All NY TRACON operation and maintenance procedures have been validated.
- (2) The NY TRACON operational software has been validated.
- (3) Procedures have been established for transition, in both directions, between the ARTS IIIE configuration and the ARTS IIIA.
- (4) All support systems as described in the Logistics Support Plan are in place.
- (5) Operations and maintenance personnel have received the appropriate certification.

85. SHAKEDOWN AND CHANGEOVER.

a. This section defines the tasks necessary to ensure the ARTS IIIE system readiness for implementation into the NAS. Primary responsibility for shakedown testing rests with ASM-160. Operational shakedown testing will be conducted at the FAATC and the NY TRACON. Shakedown shall commence at the FAATC and NY TRACON in parallel with other testing activity. During shakedown at the FAATC, the FAA will focus on determining the system readiness of operational hardware, software, procedures and personnel in a simulated environment. The contractor will be available to support the shakedown effort if necessary.

b. The operational shakedown phase at the NY TRACON will demonstrate that the ARTS IIIE system along with the NY TRACON AT and AF personnel are ready for full operation in the live air traffic environment.

c. The system configuration for operational shakedown at the NY TRACON will allow the ARTS IIIA to be taken off-line, reconfigured into an ARTS IIIE, and returned on-line as the primary processing system. The goal of the NY TRACON implementation is to transfer from the ARTS IIIA to the ARTS IIIE configuration with minimal impact on air traffic control operations.

d. Operational shakedown will commence at the NY TRACON during the time of least daily operational activity and will be conducted for short periods of time. As the system stability and reliability increase and controllers and technicians become familiar with its operation and gain confidence in the equipment, the ARTS IIIE will be employed for increasingly longer periods until it is supporting normal operations.

e. During the operational shakedown phase at the NY TRACON it will be necessary to transfer air traffic control processing back and forth between the ARTS IIIA and ARTS IIIE configuration. During the process of reconfiguring, the system will utilize broadband video to perform air traffic control operations. Shakedown procedures will be developed in such a manner that the ARTS IIIA system can return to normal operational status within a half-hour should an emergency occur.

f. In an effort to effect a smooth and rapid ARTS IIIA/ARTS IIIE transition in either direction, certification procedures will be developed and implemented. In the event that certification standards and tolerances have not been fully developed, interim standards will be based upon the demonstrated ability of the system/subsystem to perform its intended function. Software diagnostics will be used whenever practical.

g. Verification will take place in an operational environment. In the event that a function doesn't occur during the course of normal operations, consideration should be given to simulating that function. The information listed below will be provided for all required functions:

- (1) Purpose.
- (2) Area of Evaluation.
- (3) Method of Evaluation.
- (4) System Configuration.
- (5) Related Tests.
- (6) Test Team Composition.

h. Functional tests will demonstrate that the ARTS IIIE can perform all specified functions and can respond to internal and external failures. Types of functional tests include routine functions, transition, data base, internal failure, external failure, and maintenance. In addition to the verification of specific functions, the overall system-level performance must be verified. The areas which must be evaluated and verified are:

- (1) Controller Training and Procedures.
- (2) Maintenance Training and Procedures.
- (3) System Support.
- (4) Maintenance Support.
- (5) ARTS IIIE H/W.
- (6) ARTS IIIE S/W.

i. The operational shakedown phase will culminate in an Operational Readiness Demonstration (ORD) that will certify that the ARTS IIIE can perform the automation function for which it was designed, and that all logistics and personnel support systems are in place and functional. Upon completion of the ORD, a Joint Acceptance Inspection will be conducted.

j. Operation changeover is the phase of implementation wherein the ARTS IIIE system is phased into the ongoing Air Traffic control operations at the facility. The Region/Site will develop operations changeover plans to include procedures, schedules, changeover techniques, required coordination, and training requirements for phasing the ARTS IIIE into ongoing operations. The site will be responsible for implementing the changeover plans, and reporting/documenting of all operational changeover activities, to include commissioning and operational certification of the ARTS IIIE at the NY TRACON.

86. JOINT ACCEPTANCE INSPECTION (JAI). Upon the successful completion of the Operational Readiness Demonstration a Joint Acceptance Inspection (JAI) will be conducted. The JAI will be conducted by the Regional Representative(s), the AT Facility Manager, and the AF Sector Manager. The JAI will be conducted in accordance with FAA Order 6100.1A. Upon the completion of the signing of the required documentation by Headquarters, Regional Office, Air Traffic, and Airway Facilities the system will be deemed satisfactory to control aircraft and the system changeover will be complete.

87.-89. RESERVED.

CHAPTER 9. INTEGRATED LOGISTICS SUPPORT

INTRODUCTION

a. The logistic program for ARTS IIIE is based upon the requirement to design, develop, fabricate, test, deliver, install and initiate operation of the ARTS IIIE system at the New York TRACON and at the FAATC. Also, as part of the program, there is a requirement to provide hardware/firmware services for a number of RFDDs as a contract option.

b. To ensure that the best interests of the Government are being considered and to assist in ensuring that all logistic requirements suitable for the successful development of the system are being instituted, a National Airspace Integrated Logistics Support Management Team (NAILSMT) will be established. The NAILSMT will be formed as a joint team made up of Government and contractor representatives. The Government will appoint an NAILSMT chairperson who will be accountable to the Program Manager for the accomplishment of logistic efforts on the program.

c. The NAILSMT will monitor the status of the ILS program implementation and assist in the development and delivery of a supportable system at minimal cost. NAILSMT composition will be guided by Chapter 3 of the National Airspace Integrated Logistics Support (NAILS) Master Plan. Logistics program efforts will be guided by the contract Statement of Work (SOW) Part I-Section C paragraph C.4.2, CDRL items, other contract clauses, and any referenced data specified within the contract. The NAILSMT will use these guidelines to judge the status of the program's logistic effort.

90. MAINTENANCE CONCEPT. The ARTS IIIE system maintenance concept will be based upon FAA-6000.27A guidance and requirements listed in the contract Statement of Work paragraph C.4.2.7 and associated CDRL requirements. The contractor is tasked with the development of a maintenance support plan. This plan will include a statement by the contractor concerning the most appropriate methodology for accomplishing the maintenance support of the equipment. The contractor should fully discuss all aspects of maintenance support to include a recommendation, based upon critical analysis, as to the most efficient, effective and cost limiting method for accomplishing system maintenance. The contractor, as part of the recommendation for maintenance support, will provide a detailed maintenance support plan. The Contractor's Maintenance recommendation could call for contractor maintenance and engineering services in varying degrees of program support dependent upon the contractor's perception of the benefit to be derived by such support. All recommendations should be fully supported by data developed as a result of maintainability analyses.

91. TRAINING.

a. All formal training efforts for ARTS IIIE will be conducted under the guidelines of the Contract Statement of Work (SOW) paragraph C.2.5, FAA-STD-028 as delineated within the SOW, additional CDRL items, and directions issued by the government through the program office AAP-320 or the ILSMT.

b. Training efforts will be developed under strict adherence to FAA-STD-028 guidelines and as specified within the data contained in the contract SOW paragraph C.2.5. This training will be conducted as specified within the SOW. Both hardware and software maintenance course will be provided under these guidelines. Expected course goals are as described in SOW paragraph C.2.6.1 and C.2.6.2 for maintenance personnel and C.2.6.3 for controller personnel.

c. Training courses to be provided under the guidelines of the contract include the following courses to be delivered under requirements of CDRLs E-070, 074, 078, 080, 081, and 082:

- (1) Lecture - Laboratory Maintenance Training, Stage 1.
- (2) Lecture - Laboratory Software Training, Stage 1.
- (3) Lecture - Laboratory Maintenance Training, NY TRACON ARTS IIIE.
- (4) Lecture - Laboratory Software Training, NY TRACON ARTS IIIE.
- (5) Lecture - Laboratory Controller Training, Stage 1.

92. SUPPORT TOOLS AND TEST EQUIPMENT.

a. The contractor is responsible for the identification and documentation of all required support and test equipment. This will include common and/or unique tools, test equipment, jigs, fixtures, test stands, etc., which are required for the performance of maintenance tasks at all identified maintenance levels. These items will be provided to the government as specified within the contract SOW. In addition to identification, requirements for unique support and test equipment shall be justified and the equipment will be completely described to enable the Government to make the best determination in satisfying the requirement.

b. The contractor will endeavor to ensure that items currently in the FAA inventory or currently used to support other FAA equipment or at the least available within the Government inventory are used to meet system support requirements.

93. SUPPLY SUPPORT.

a. Supply support requirements, in the form of Provisioning Technical Documentation (PTD), will be accomplished under the guidelines of the Contract SOW paragraphs C.4.2.8 and C.6. All provisioning efforts for the program will be based upon MIL-STDs 1388-2A and 1561B. Formatting of PTD will be accomplished in accordance with specified CDRLs.

b. Supply support for the program will be developed through the provisioning method of procurement as stated in paragraph C.6 of the Contract SOW. The contracting officer will determine the extent of Government purchase of spare parts and assemblies and will reach a negotiated delivery price and terms of delivery of the desired items.

c. A provisioning conference will be held as stated in paragraph C.7 of the contract SOW. The contractor will be responsible for documentation and background information for all aspects of the provisioning effort. Additionally, the contractor will provide full administrative support for provisioning aspects of the program.

94. VENDOR DATA AND TECHNICAL MANUALS. The contractor is obligated to provide technical documentation as per the contract SOW paragraph C.4.2.12. Instruction manuals covering the maintenance, operation, installation, and test equipment requirements of the program will be provided under guidelines provided within paragraph C.4.2.12. Drawings will be provided to the government in accordance with FAA-STD-002 and SOW C.4.2.12. Additionally, tape formatting of drawing data will be provided in accordance with SOW C.4.2.12. The contractor will provide computer manuals in accordance with C.4.2.12.

95. EQUIPMENT REMOVAL. The Eastern Region will be responsible for the planning and execution of equipment removal actions incidental to the accomplishment of the ARTS IIIE program.

96. LOGISTIC SUPPORT CONCEPT - NAILS PROGRAM.

a. The ARTS IIIE program will be guided by the provisions of the NAILS Master Plan. NAILS is an interrelated, unified, and iterative approach to program logistics support. NAILS concepts, applied to the initial phases of a hardware acquisition program, have a direct beneficial influence on system requirements determination and design. NAILS provides a means for the attainment of cost minimization during a system's operational lifespan by the comprehensive identification of support requirements during the design, development, and production phases of the acquisition process. The NAILS program accomplishes its goals through the application of a standardized task flow. This flow is segregated into five specific areas:

- (1) Logistics program planning and control.
- (2) Mission and support system definition.
- (3) Alternatives preparation and evaluation.
- (4) Determination of Logistics support resource requirements.
- (5) Supportability assessment.

b. The accomplishment of these analyses early in a program's development cycle will help to identify Logistic constraints and potential areas for support improvement.

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APPENDIX 1. ACRONYMS

ACCC	-	Area Control Computer Complex
ACIA	-	Atlantic City Improvement Authority
AEA	-	Eastern Region
AES	-	System Engineering
ALG	-	Acquisition and Material
ARTCC	-	Air Route Traffic Central Center
ARTS	-	Automated Radar Terminal System
ASR/ATCRBS	-	Airport Surveillance Radar
ASSY	-	Assembly
ATC	-	Air Traffic Control
ATO	-	Air Traffic Operation
	-	Assistant Technical Officer
ATR	-	Air Traffic Plans and Requirements
BANS	-	BRITE Alpha Numeric Subsystem
BPM	-	Breakpoint
BRITE	-	Bright Radar Indicator Tower Equipment
CA	-	Conflict Alert
CBBS	-	Channel Back to Back Switch
CCD	-	Configuration Control Decision
CDR	-	Continuous Data Recording
CDRL	-	Contract Data Requirements List
CDT	-	Console Data Terminal
CM	-	Configuration Management
CMC	-	Communications Multiplexer Controller
CO	-	Contracting Officer
CP	-	Central Processor
CR	-	Card Reader
CRC	-	Card Reader Controller
CTS	-	Central Track Store
DEDS	-	Data Entry and Display Subsystem
DP	-	Display Processor
DPS	-	Display Processing Subsystem
EARTS	-	Enroute Automated Tracking Systems
ETG	-	Enhanced Target Generator
FAA	-	Federal Aviation Administration
FAATC	-	Federal Aviation Administration Technical Center
FACT	-	Factory Acceptance Testing
FDAD	-	Full Digital ARTS Display
FIG	-	FAATC Integration Group
GFE	-	Government Furnished Equipment
HVAC	-	Heating, Ventilation, Air Conditioning
I&T	-	Integration and Testing
ICU	-	Iterim Capacity Upgrade
IEEE	-	Institute of Electrical and Electronics Engineering
IFR	-	Instrument Flight Rules
INCO	-	Installation and Checkout
I/O	-	Input/Output

APPENDIX 1. (cont.)

IOC	-	Initial Operating Capability
IOP	-	Input/Output Processors
IOPB	-	Input/Output Processor Board
INCO	-	Installation and Check-Out
IV&V	-	Independent Validation and Verification
JAI	-	Joint Acceptance Inspection
LAN	-	Local Area Network
LBP	-	Local BANS Processor
LSA	-	Logistics Supportability Analysis
LSAR	-	Logistic Support Analysis Record
MDBM	-	Multiplexed Display Buffer Memory
MIPS	-	Million Instruction Per Second
MLS	-	Microwave Landing System
MSAW	-	Minimum Safe Altitude Warning
MSP	-	Minneapolis - St. Paul
MTS	-	Medium Speed Printer
NAS	-	National Airspace System
NCP	-	NAS Change Proposal
NDRO	-	Non-Destructive Read Out Memory
NIA	-	Network Interface Adapter
NY TRACON	-	New York Terminal Radar Approach Central
ORD	-	Operational Readiness Date
PCAB	-	Processor Cabinet
PDL	-	Program Design Language
PIP	-	Project Implementation Plan
PLD	-	Program Load Device
PM	-	Project Manager
POFA	-	Program Operational Functional Appraisal
PSR	-	Preship Review
PTD	-	Provisioning Technical Documentation
QR	-	Quality/Reliability Officer
RALM	-	Recovery Alarm
RFDD	-	Remote Full Digital Display
RFDU	-	Reconfiguration and Fault Detection Limit
RFP	-	Request For Proposal
RIG	-	Regional Integration Group
RTC	-	Real Time Clock
SSC	-	System Support Computer
SMC	-	System Monitor Console
SOW	-	Statement Of Work
SRAP	-	Sensor Receiver and Processor
SSM	-	Solid State Memory
TO	-	Technical Office
TP	-	Tracking Processor
WWV	-	Radio Time Reference

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Appendix 2

APPENDIX 2. PROJECT MILESTONES

NEW YORK TRACON ACTIVITIES-STAGE 1

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report date: 5-NOV-1987

ACTIVITY DESCRIPTION =====	REPLAN DATE =====	ACTUAL FINISH =====
ACQUISITION =====		
FIRST DISPLAY RELEASED FOR REFURBISHMENT	16-MAY-1988	
SYSTEM REQUIREMENTS STATEMENT APPROVED(AT LETTER)		20-FEB-1985
PROCUREMENT REQUEST RELEASED FOR EQUIPMENT		4-MAR-1985
SPECIFICATION REVIEW BOARD (SRB) APPROVAL		14-JUN-1985
SOLICITATION ISSUED BY ALG		24-JUN-1985
COST/TECHNICAL REVIEW COMPLETED		8-NOV-1985
CONTRACT AWARDED(N.P. 3/86)		14-MAR-1986
DESIGN =====		
PRELIMINARY DESIGN REVIEW (PDR) COMPLETED (STAGE 1)		24-SEP-1986
SYSTEMS REQUIREMENTS REVIEW COMPLETED (SRR)		24-SEP-1986
PREPARE ICU PROGRAM PLAN		23-JUL-1987
CRITICAL DESIGN REVIEW (CDR) COMPLETED (STAGE 1)		4-AUG-1987
LIMITED TURN ON OF ICU PROJECT		3-SEP-1987
SOFTWARE =====		
PREPARE ICU SIZING ANALYSIS		18-SEP-1987
PRODUCTION =====		
TRAINING MATERIAL DELIVERED (CONTROLLER)	8-DEC-1987	
TRAINING MATERIALS DELIVERED (MAINT.)	15-DEC-1987	
TRAINING MATERIALS DELIVERED (S/W)	15-DEC-1987	
CODE AND UNIT TEST COMPLETED	15-DEC-1987	
PROJECT IMPLEMENTATION PLAN APPROVED	5-JAN-1988	
FDADS DELIVERED TO NYT	29-JAN-1988	
SYSTEM DELIVERED TO TEST AND EVALUATION SITE (FAATC) (STAGE 1)	1-FEB-1988	
OPERATOR/MAINTENANCE TRAINING BEGINS (STAGE 1)	1-FEB-1988	
DRR REPORT DELIVERED TO ADL-2	8-FEB-1988	
SYSTEM DELIVERED TO FIRST OPERATIONAL SITE (NYT) (SIT)	5-MAY-1988	
INTEGRATED LOGISTICS SUPPORT (ILS) PLAN APPROVED		22-APR-1987
TEST EQUIPMENT DELIVERED		1-OCT-1987
PROVISIONING TECH DOCUMENTATION/LSA DATA DELIVERED		13-OCT-1987
INITIATE THE DRR PROCESS		13-OCT-1987
PROVISIONING CONFERENCE (STAGE 1)		5-NOV-1987
TESTING =====		
PERFORM SUBSYSTEM INTEGRATION	20-NOV-1987	
SSM DELIVERED TO FAATC (2)	23-NOV-1987	
SSM INSTALLED AT FAATC(2)	23-DEC-1987	

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APPENDIX 2. (cont.)

NEW YORK TRACON ACTIVITIES-STAGE 1

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report date: 5-NOV-1987

ACTIVITY DESCRIPTION =====	REPLAN DATE =====	ACTUAL FINISH =====
TESTING		
=====		
FACTORY ACCEPTANCE TEST COMPLETED	11-JAN-1988	
SSM DELIVERED TO NYTC (2)	22-JAN-1988	
SSM INSTALLED AT NYT(2)	5-FEB-1988	
PRESHIP REVIEW (PSR)	16-MAR-1988	
COMPLETE SYSTEM TEST AT FAATC	15-APR-1988	
ACT-100 INTEGRATION TEST COMPLETED	10-MAY-1988	
ATR (ACCEPTANCE TEST REVIEW)	13-MAY-1988	
APM-160 SHAKEDOWN TEST COMPLETED	15-JUN-1988	
SITE ACCEPTANCE AND INTEGRATION TEST COMPLETED (IOC) (PH I NY)	22-AUG-1988	
TATR	23-SEP-1988	
PCA	7-OCT-1988	
FCA	24-OCT-1988	
SITE ACCEPTANCE TEST PLANS APPROVED		13-AUG-1987
FACTORY ACCEPTANCE TEST PLAN APPROVED(SITP)		13-AUG-1987
APM-160 SHAKEDOWN TEST PLAN APPROVED(STAGE I)		28-AUG-1987
ACT-100 INTEGRATION TEST PLAN APPROVED		28-AUG-1987
SSM FACT		9-OCT-1987
IMPLEMENTATION		
=====		
FIRST OPERATIONAL READINESS DATE (ORD)(STAGE I NY)(N.P.12/88)	24-OCT-1988	
SOFTWARE RELEASE VERSION A5.05		13-MAY-1986

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Appendix 2

APPENDIX 2. (cont.)

NEW YORK TRACON ACTIVITIES-STAGE 2

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report date: 5-NOV-1987

ACTIVITY DESCRIPTION =====	REPLAN DATE =====	ACTUAL FINISH =====
ACQUISITION =====		
SYSTEM REQUIREMENTS REVIEW COMPLETED (SRR)(STAGE 11)	5-JAN-1988	
DESIGN =====		
CONDUCT SYSTEM REQUIREMENTS REVIEW (SRR) (STAGE 11)	7-DEC-1987	
PRELIMINARY DESIGN REVIEW (PDR) COMPLETED (STAGE 2)	9-MAR-1988	
CRITICAL DESIGN REVIEW (CDR) COMPLETED (STAGE 2)	6-JUN-1988	
PRODUCTION =====		
PROVISIONING TECH DOCUMENTATION/LSA DATA DELIVERED	2-AUG-1988	
PROVISIONING CONFERENCE (STAGE 11)	2-SEP-1988	
SYSTEM DELIVERED TO TEST AND EVALUATION SITE (FAATC) (STAGE 2)	20-SEP-1988	
INITIATE THE DRR PROCESS	11-OCT-1988	
TRAINING MATERIALS DELIVERED (S/W)	3-JAN-1989	
TRAINING MATERIALS DELIVERED (MAINT.)	3-JAN-1989	
TEST READINESS REVIEW (TRR)	2-FEB-1989	
DRR REPORT DELIVERED TO ADL-2	6-FEB-1989	
OPERATOR/MAINTENANCE TRAINING BEGINS (STAGE 11)	1-MAR-1989	
FAATC ACCEPTANCE TEST REVIEW (ATR)	31-MAR-1989	
SYSTEM DELIVERED TO FIRST OPERATIONAL SITE (NYT) (SIT)	7-APR-1989	
TESTING =====		
FACTORY ACCEPTANCE TEST PROCEDURES APPROVED	14-APR-1988	
SITE ACCEPTANCE TEST PLAN APPROVED	4-MAY-1988	
CODE AND UNIT TEST(CUT) COMPLETED	14-JUL-1988	
APM-160 SHAKEDOWN TEST PLAN APPROVED(STAGE 11)	15-JUL-1988	
FACTORY ACCEPTANCE TEST COMPLETED	22-JUL-1988	
PRESHIP REVIEW (PSR)	2-SEP-1988	
TEST EQUIPMENT DELIVERED	20-SEP-1988	
SUBSYSTEM INTEGRATION (SSI)	21-OCT-1988	
SYSTEM TEST (FAATC)	23-FEB-1989	
APM-160 SHAKEDOWN TEST COMPLETED	27-MAR-1989	
PHYSICAL CONFIGURATION AUDIT (PCA)(STAGE 2)	28-MAR-1989	
FUNCTIONAL CONFIGURATION AUDIT(FCA)	28-MAR-1989	
SITE ACCEPTANCE AND INTEGRATION TEST COMPLETED (IOC) (PH 11 NY)	12-OCT-1989	
IMPLEMENTATION =====		
NY TRACON ACCEPTANCE TEST REVIEW (TATR)	13-NOV-1989	
FIRST OPERATIONAL READINESS DATE (ORD) (STAGE 11 NY)(N.P. 2/90)	12-DEC-1989	



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APPENDIX 3. PROJECT CONTACTS

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	Linda Brown	Training Requirements	(202) 267-9207	267-9207	
	Alan Cunningham	Systems	(202) 267-9178	267-9178	
	Cliff Wagner	Air Traffic Plans	(202) 267-9445	267-9445	
ACT-120	Steve Devlin	Sys. Evaluation, Testing and Enhancements	(609) 484-6837	482-6837	Federal Aviation Administration Eastern Region Headquarters Attn: () JFK International Airport Fitzgerald Federal Building Jamaica, New York 11430
ASM-161	Bob McCarthy (ATO)		(609) 484-5003	482-5003	
	Margaret Jacques		(609) 484-4352	482-4352	
ASM-164	Dick Ziebart	Terminal Systems Lead	(609) 484-4237	482-4237	
	Art Czachorowski	Systems Specialist	(609) 484-6350	482-6350	
ATR-244	Mike Gallagher	Automation Engineering	(609) 484-4279	482-4279	
	Tony Durso	Technical Lead	(609) 484-6259	484-6259	
ACT-620	Ruben Conde	Electrical Engineer	(609) 484-4288	482-4288	
	Jack Hennighan	Supervisor NY TRACON (Acting)	(609) 484-6042	482-6042	
ACT-570	Frank Callio	Preparation & Installation	(609) 484-5987	482-5987	
AEA-400 AEA-510 AEA-422	Vince Lasewicz	Test Management	(609) 484-5890	482-5890	
	Ted Turnock		(609) 484-5866	482-5866	
AEA-400 AEA-510 AEA-422	John McEvoy	Eastern Region - AF	(718) 917-1171	667-1171	
	Frank Storr	Eastern Region - AT	(718) 917-1221	667-1221	
	Arthur Haugh	Training	(718) 917-1179	667-1179	

APPENDIX 3. (cont.)

N-90 AFSFO-841-1	Marty Lilly Tony Borden Tom Marcinek Al Lee Leonard Michalski	TRACON-AI Asst-Facility Mgr TRACON-AF	(516) 683-6071 (516) 683-2902 (516) 683-2827 (516) 683-2800 (516) 683-0819	664-6071 664-2902 664-2827 664-2800 667-0819	Federal Aviation Administration NY TRACON Attn: () 1515 Stewart Avenue Westbury, New York 11590
AAC-944D AAC-944D AAC-485 AAC-932B	Steve Mason Rod Lamb John Bodnar Ed Koscielniak	Academy - Training Academy - Training Depot - Provisioning	(405) 686-2626 (405) 686-4175 (405) 686-4661 (405) 686-4703	749-2626 749-4175 749-4661 749-4703	Mike Monroney Aeronautical Center 6500 South MacArthur P.O. Box 25082 Attn: () Oklahoma City, OK 73125
MITRE	Bob Geoghan	Consultant	(609) 484-5333	482-5333	Mitre Corporation c/o FAA Technical Center Atlantic City Airport Atlantic City, New Jersey 08405
SEIC	Ed Johnson Bill Porter Ahmed El-Sahragly John Raper Laura MacGill Mark Wall Ken Simmons Bill Rivers Don Waite Gerry Trenholm Bob Whittaker Ron Endicott Tom Carroll Lauretta Stewart Becky Bates Susan Ashlian Wayne Fuller	Assoc. Program Mgr. Test Lead Design Lead Accept/Integ. Test at Tech Center: Documentation Management Support Test Interface Hardware Engineer Shakedown Test Provisioning Logistics RMA Training Configuration Management Planning Finance Communications	(202) 646-5321 (202) 646-5423 (202) 646-5528 (202) 646-5303 (609) 484-5747 (202) 646-5527 (202) 646-5526 (202) 646-5891 (202) 646-5317 (202) 646-4852 (202) 646-5484 (202) 646-6926 (202) 646-5855 (202) 646-5587 (202) 646-5881 (202) 646-5302 (202) 646-5756 (202) 759-1027	967-5321 967-5423 967-5528 967-5303 482-5747 967-5527 967-5526 967-5891 967-5317 967-4852 967-5484 967-6926 967-5855 967-5587 967-5881 967-5302 967-5756	Martin Marietta Corporation Attn: () 475 School Street, S.W. Washington, D.C. 20024

APPENDIX 3. (cont.)

LOGICON	Tom Kilpatrick Maureen Frankowski Jane Strockbine	IV&V Project Mgr. Computer Scientist Computer Scientist	(202) 646-2223 (202) 646-5553 (202) 646-5488	N/A	Logicon 475 School Street, S.W. Attn: () Washington, D.C. 20024
QRO	Verle Willis	Quality Reliability Officer	(813) 855-8483 Sperry St. Paul (612) 456-4912	826-2316	Sperry Univac DSD P.O. Box 6000 M/S 14B Clearwater, FL 33518 Attention: FAA Rep.
ATC Tampa	Joe Lunder	Tampa Tower	(813) 228-2880 or (813) 872-1528	826-2880	FAA ATCT Tampa International Airport Attention: Joe Lunder Tampa, FL 33607
SEIC/FAATC SEIC/FAATC SEIC/FAATC SEIC/FAATC	Joe Sammon Rich Coughlin Rich Mendell Lew Markel	Test Integration Test Plan/Imp. Transition Planning	(609) 484-5066 (609) 484-5547 (609) 484-4283 (609) 484-4315	482-5066 482-5547 482-4283 482-4315	FAA Technical Center Attn: () Atlantic City, Airport Atlantic City, NJ 08405



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APPENDIX 4. REFERENCES

1. Atlantic City Improvement Authority (ACIA) Contract 10 - FAA Technical Center Plot Plan and Architectural Drawings
2. ACIA Contract 11 - HVAC and Piping Drawings
3. ACIA Contract 12 - Plumbing and Sprinkler Drawings
4. ACIA Contract 13 - Equipment Grounding Drawings
5. Title 41, Code of Federal Regulations
6. Federal Property Management Regulations, Part 101
7. FAA Order 4660.1 - Real Property Handbook
8. ACIA Contract 17 - Lighting and Power Drawings
9. NASP-5204-01 Volumes I and II
10. New York TRACON ARTS IIIE Request for Proposal
11. Contract DTFA01-86-C-00006
 - (a) CDRL-E-022 Interface Design Document
 - (b) CDRL-E-040 Engineering Drawings
 - (c) CDRL-E-048 Interface Control Document
 - (d) CDRL-E-010 FAATC Installation Plan
 - (e) CDRL-E-011 NY TRACON Installation Plan
 - (f) CDRL-E-034 System On-Site Acceptance Test Report
12. FAA Regional As-Built Standard Drawings
Series D-5906, E-5896
13. FAA Order 6480.7 - Airport Traffic Control Tower and Terminal Radar Approach Control Facility Design
14. FAA Order 6100.1A
15. FAA Order 1810.1D
16. Contract DTFA01-84-C-00017, Chapter 10

